MECCANO® Magazine

DECEMBER 1972

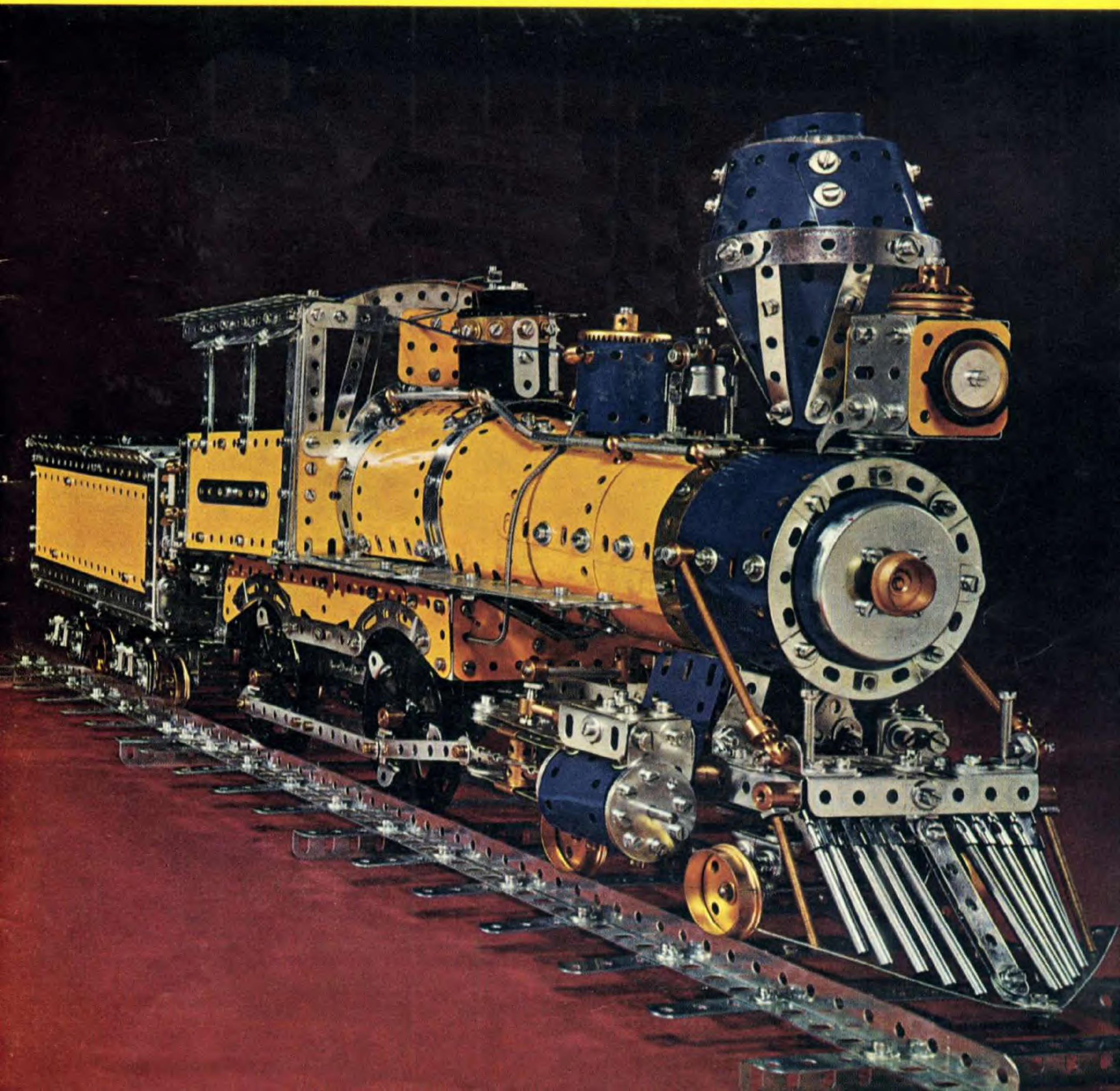
15p

U.S.A. & CANADA
SEVENTY-FIVE CENTS

★ ENAMELLING • MOTION PICTURES
MECCANO FAIRGROUND RIDE ★

MAP HOBBY MAGAZINE

FOR THE INVENTIVE AND THE INQUISITIVE





All Humbrol quality enamels are available in separate tinlets or in tinlet palettes—attractive and convenient interlocking plastic trays with space for brushes and accessories.

Skill, patience and Humbrol

Or should it be Humbrol, patience and skill? Either way, these are the three most important qualities for successful modelling.

Skill and patience—well, most serious modellers have them, Humbrol is the quality they all need. Used by modellers the world over, Humbrol enamels (matt or gloss, lead free and non-toxic) are the best value for money on the modelling market . . . only 8p for 15ml. Research has established that craftsmen prefer model paint in tins which keep the paint in good condition, are unbreakable and much safer than any other type of container—this is why Humbrol is packed in handy sized tinlets. You'll find the colour you're looking for in the Humbrol range.

Ask for Humbrol by name . . .
available from all leading Model and Toy Shops.





Balsa cement 66 for sticking balsa models. Med. tube 7p
White PVA 55 for sticking wooden models. Med. tube 10p.
Polystyrene cement 77 for sticking plastic models. Med. tube 7p.
All Britfix tubes have a specially designed shoulder cap with internal spigot preventing blockage of nozzle and giving immediate flow when cap is removed.

Humbrol will be pleased to send you—*FREE*—colour cards and leaflets giving you full details of the extensive range of enamels and other Humbrol quality products for the modeller. Write today to Mr. H. Stewart, Modelling Division, Humbrol Limited, Marfleet, Hull.

HUMBROL
HULL YORKSHIRE

MECCANO® Magazine

DECEMBER 1972 VOLUME 57 NUMBER 12
Meccano Magazine, founded 1916

Editorial Director
D. J. LAIDLAW-DICKSON

Managing Editor
V. E. SMEED

Consulting Editor for MECCANO
J. D. McHARD

Group Advertisement Manager
J. PATRICK

MAP **HOBBY MAGAZINE**

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

FRONT COVER

The winning model in the very successful Meccano "Globe-Trotting" Competition, a magnificent working steam powered model of a locomotive in Disney World by Mark Knowles of Laverstock, Salisbury, Wilts. An article on the construction of this super model will feature in the first Meccano Magazine Quarterly.

Advertisements and Subscription Offices: Model & Allied Publications Ltd., 13-35 Bridge Street, Hemel Hempstead, Hertfordshire. Tel.: Hemel Hempstead 2501-2-3.

This periodical is sold subject to the following conditions: that it shall not, without the written consent of the publishers, be lent, re-sold, hired-out or otherwise disposed of by way of Trade at a price in excess of the recommended maximum price and that it shall not be lent, re-sold, hired-out or otherwise disposed of in a mutilated condition, or in any unauthorised cover by way of Trade; or affixed to or as part of any publication of advertising, literary or pictorial matter whatsoever.

Correspondence anticipating a reply must be accompanied by stamped and self addressed envelope or international reply coupon.

While every care is taken no responsibility can be accepted for unsolicited manuscripts, photographs or art work, etc.

The Advertisement Manager reserves the right to refuse or suspend advertisements without giving any reason. Every care is taken to avoid mistakes, but the publishers cannot be held liable in any way for clerical and printing errors or omissions. Receipt of "copy" for publication implies acceptance of these conditions by the advertiser. Whilst every care is taken to exclude advertisements from doubtful sources, no responsibility can be accepted by the publishers for the bona fides of advertisers.

Publishers of Aeromodeller, Model Boats, Model Cars, Model Engineer, Radio Control Models, Model Railways, Scale Models, Woodworker, Military Modelling.

CONTENTS

ON THE EDITOR'S DESK 581
An important announcement

ENAMELLING 582
Real powdered glass and copper

THE FIRST MOTION PICTURES 584
A history of film

THE SCIENCE OF SUNDIALS 586
More decorative than practical these days

DONNINGTON BREWERY 588
A small family concern

"TYRED" MODELS 590
Dinky tyres and Meccano parts

MANAGING DIRECTOR'S STATEMENT 593
A personal note from Mr. H. J. Fallman

PIERS OF THE REALM 594
English seaside piers

LORDS OF THE SEA 595
The Vikings

RIVET-MAKING MACHINE 597
A four part series concluded

RISING SWINGERS 598
An intriguing fairground ride

TRACTOR DRIVERS 601
Would you like to be one?

BRIDGE DESIGN 602
Part II—Bailey Bridges

AIR NEWS 604
News from the world of aviation

NATURE'S DEADLY HARVEST 606
Many plants are poisonous

A MILITARY YEAR 608
Dinky Toys News

MECCANO PARTS 610
And how to use them—Part 12

500 MOUNTAINS 611
Volcanoes of the world

BUTTERFLIES ON STAMPS 612
Colourful issues

MUCK INTO MONEY 613
Salvage money from rubbish

AMONG THE MODEL BUILDERS 615
'Spanner' with more mechanisms

MODEL & ALLIED PUBLICATIONS LTD.
13-35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTFORDSHIRE

MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION

MODEL ENGINEER EXHIBITION 1973

42nd GREAT SHOW!

SEYMOUR HALL, LONDON, W.1.

2nd January — 13th January 1973

(Not Sunday)

Daily 10 a.m.—9 p.m.: 2nd Jan. opens 2.30 p.m.; last Sat. closes 7 p.m.

Model Aircraft, Locomotives Boats, Traction Engines Military Models, Crafts

COMPETITORS

£300 in prizes . . . some 30 cups, trophies and other awards. Championships Cups for permanent retention. A win confers "Expert Status!" Special! New S.M.E.E. presentation: Edgar Westbury Memorial Challenge Trophy.

ENTRY CLASSES

Examples of every form of modelmaking activity on show. Model engineering masterpieces, locomotives, traction engines, aircraft, boats, yachts, cars . . . simple plastic creations. Classes include Military Models (six classes) and Craft entries (Furniture, glass fibre, etc.).

WHAT WILL BE ON DISPLAY

Last year's OPEN PLAN arrangement of the MAIN HALL was so widely praised that we are continuing this general scheme with even better access and viewing, whilst retaining the concourse round the WINNERS PODIUM – (This year we hope winners will fit this stand!) A slight change in S.M.E.E. WORKSHOP will allow spectators better viewing without blocking a door. "Bill" Carter will again be in charge of the S.M.E.E. PASSENGER RAILWAY with non-stop service during opening hours for young and old. The team of experts from the Society will be providing practical work and advice to visitors.

LARGE FLYING CIRCLE – balcony to balcony – again in operation with even more exciting and expert models, and operators. All-electric models that do most of the things that i.c. powered control line models do. It gets better every year.

TRADE STANDS – We have slightly increased numbers this year in view of increasing demand from exhibitors. These are in MAIN HALL; a few smaller, DEMONSTRATION STANDS in BRYANSTON ROOM will show construction techniques and use of tools.

Introduction of a MODEL ENGINEER WORKSHOP manned by the S.M.E.E. last year proved immensely popular and will be increased in size and scope, again with experts from S.M.E.E. in charge and assisted by M.E. consultants. Working models under compressed air will also be on show.

CRAFT DEMONSTRATIONS will include Gildas Jaffrenou with his FOLK HARPS . . . making and playing.

BRYANSTON ROOM will again be a CLUBMEN'S CORNER with stands manned by the principal governing model bodies, plus club unit demonstrations, and trade demonstrations.

STOP PRESS! Magnificent moving DIORAMA of Napoleon reviewing troops from Army Museum, Paris.

LECTURE HALL will house the clubs connected with MILITARIA – British Model Soldiers Society, International Plastic Modellers' Society etc. – and also display the entries in the MODEL SOLDIER classes, including new Special Air Service Trophy entries.

COMMITTEE ROOM will provide regular 50-seat sessions for BATTLE GAMES on announced themes with expert commentary. Advance booking by ticket at the exhibition.

BOATING MARINA. Following last year's successful launch of this feature some improvements will be made to spectator accommodation Timed sessions will be held. TRADE DEMONSTRATIONS of RADIO CONTROLLED BOATS will be welcomed (please let us hear early) which will be varied with CLUB EVENTS (mainly in evenings) and STAFF EXHIBITS. There will be no selling at the poolside, but demonstrations can be announced and suitable display cards shown advising visitors where products obtainable and information given. Club features or displays specially invited – drop us a line!

GALLERIES provide sitting out space for several hundred persons, and offer best view of model aircraft flying. There will also be club exhibits displayed and entries in our BOYS EXHIBITION.

SOUVENIR GUIDE

Another CHRISTMAS EXTRA issue of *Model Engineer* will be coming out 2nd Friday in December with entries, trade stands, articles galore to assist the visitor and solace the stay-at-home.

PRIZE POOL ALLOCATION

Classes attracting six or more entries will enjoy prizes to value of 1st £5; 2nd £3; 3rd £1. With over 12 entries 1st £7; 2nd £4; 3rd £2; 4th £1. Classes under six will have 1st & 2nd only, or at discretion of the judges may be combined with other classes.

REFRESHMENTS

Snack Bar in the Balcony Cafe, with teas, soft drinks, sandwiches, cakes, Restaurant Service (licenced) available on ground floor. Parties may book in advance.

ADMISSION

Price of admission at the door will be 30p adult, 15p child. A child is regarded as anyone still at school. Children under 5 who have not started school and are accompanied will not be charged.

Reduced admission charges for pre-booking as under:

Single and small number pre-booking tickets available from these offices. Adult 25p, Child 12½p. Parties of more than 10: Adult 20p, Child 10p, Teachers i/c parties free—one per 10 in party.

A combined family ticket can also be bought in advance.

Advance Bookings and details from:
EXHIBITION MANAGER,
M.A.P. Ltd. 13/35 BRIDGE STREET,
HEMEL HEMPSTEAD, HERTS.

MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION

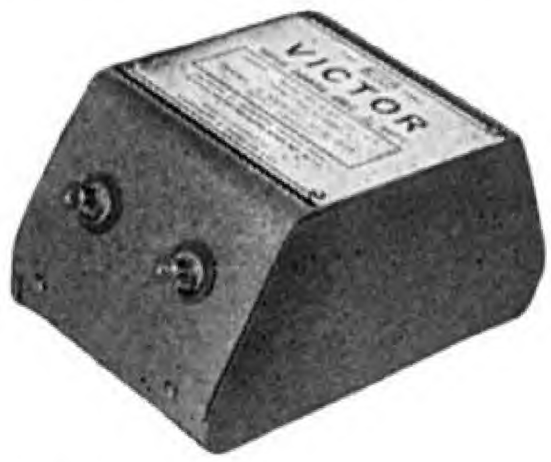
KINDLY MENTION "MECCANO MAGAZINE" WHEN REPLYING TO ADVERTISEMENTS



Round and round it whirls! As it whirls round it makes a whistling sound—and lights up too! See how fast it goes — see how bright it glows! The sparkling craze that's sweeping America comes to Britain! Go crazy—take a spin round to your local toyshop now—for Astro Lite. Made by Meccano.

VICTOR
SUPER POWER UNIT!

PRICE **£3.00**



More power for your 12 v. D.C. motors!
More speed!
A Super Power Unit operating from 200-240 v. A.C.
Output 12 v. D.C. Maximum output 2½ amps.
Protected by thermal cut-out.
Guaranteed for 12 months.

SEND FOR FREE PRICE LIST

HAMMANT & MORGAN LTD.
HANDEM WORKS, APEM ESTATE,
134 ST. ALBANS ROAD, WATFORD, HERTS



FOR EXPERIENCED SUBBUTEO PLAYERS

Subbuteo Football Express. Five-a-side table-top soccer.
Play this fast moving, spectacular football in your own home and enjoy all the thrills and skills of five-a-side soccer.
This is the ideal companion game to Subbuteo full team editions. Subbuteo Express comes complete with special pitch, rebound walls, lock-in goals, complete teams, balls and full playing instructions. **£4.20** r.s.p.
Ask at your local Sports, Toyshop or Department Store.
In case of difficulties write for literature and list of stockists to:

Subbuteo Subbuteo Sports Games Ltd., Dept. **E.4.**
Langton Green, Tunbridge Wells, Kent.

MECCANO SPECIALISTS

MECCANO SETS

No. 1	£1.29
No. 2	2.10
No. 3	2.90
No. 4	3.90
No. 5	5.85
No. 6	7.80
No. 7	9.75
No. 8	11.95
No. 9	25.45
No. 10	103.00
Pocket Set	0.39

SPECIAL SETS

3M	£4.35
4M	6.55
4EL	10.95
5ME	14.65
Gears set	2.20
Electronic set	4.75
Mechanisms set	3.80
Super Tool set	1.15

CONVERSION SETS

1X	0.87
2X	0.93
3X	1.22
4X	2.25
5X	2.45
6X	2.25
7X	3.20
8X	8.80

PLASTIC SETS

No. 100	1.10
No. 200	2.20
No. 300	3.80
No. 400	5.85

SPARES

Full Range of Metal and Elektrikit spares stocked. S.A.E. for List

TAX FREE

All Sets & Motors sent Tax Free to customers overseas.

SPECIAL PRICES

To All Schools, Colleges and Industry.

Post & Packing Free on all orders £5 and over, U.K. only.

MOTORS

Magic Clockwork	0.95
No. 1, Clockwork	2.45

ELECTRIC

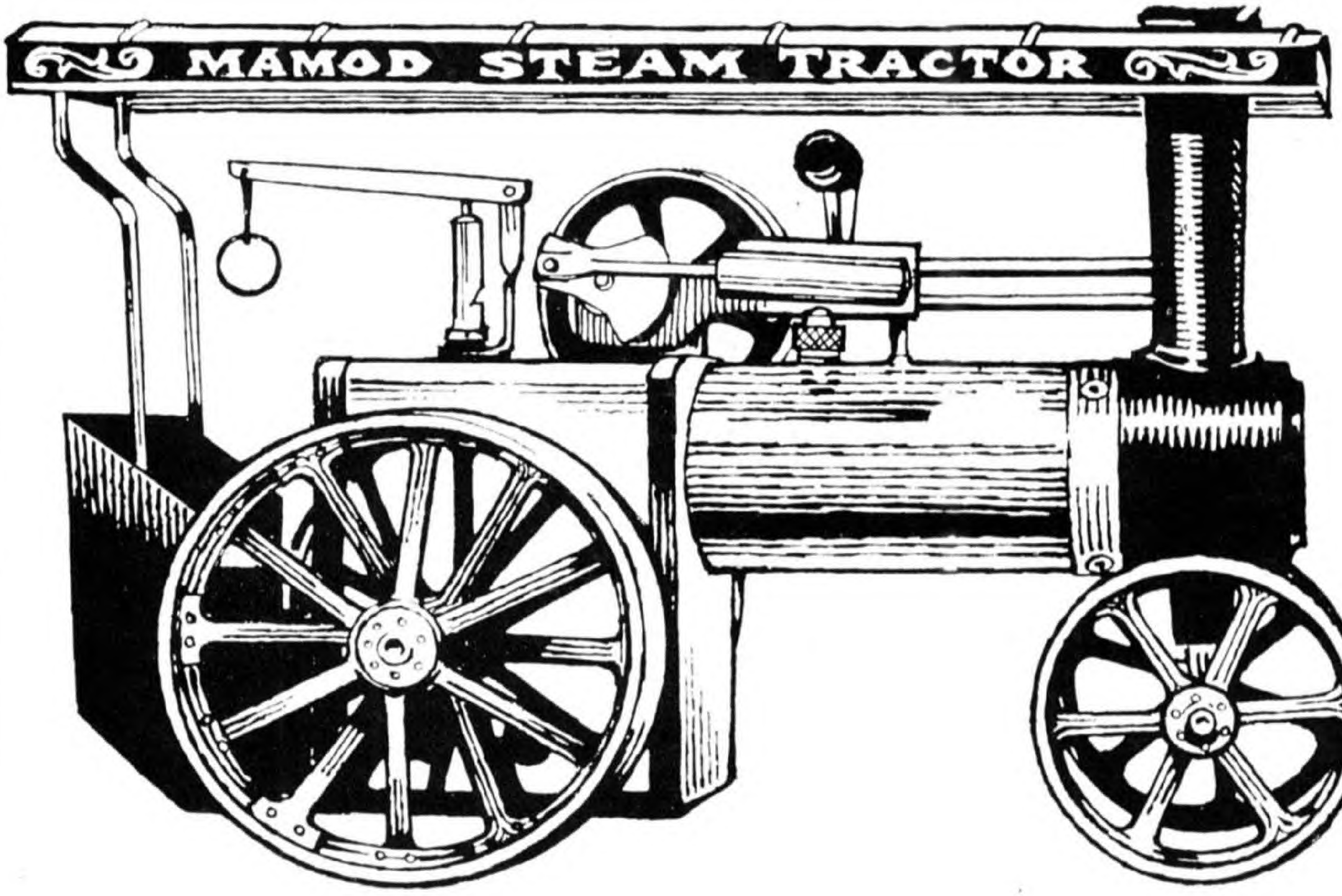
4½ volt DC	1.55
6 Ratio Gearbox & DC Motor	3.75
6 Ratio Gearbox & Coupling	2.50
L.V. Hand Generator	1.65
E 15 R Motor	5.80
Battery Box	1.45
Steam Engine	4.65
No. 1. Clock Kit	3.40

MAMOD

Minor 1	2.45
Minor 2	3.25
SE 1A	4.05
SE 2A	4.85
SE 3A	7.25
Polishing Machine	0.55
Grinding Machine	0.55
Power Press	0.59
Power Hammer	0.59
Lineshaft	1.10
SR1A	7.25
TE1A	7.75
SW 1 Steam Wagon	11.25
LW 1 Lumber Wagon	1.95
Open Wagon	1.95
Marine Engine ME1	4.05
Marine Engine ME3	4.05
Driving Band	0.06

JOHN W. BAGNALL LTD. SALTER STREET, STAFFORD
TEL: 3420
EST. 1936

For children aged seven to seventy.



Something for boys and grandads to get really steamed up about. Mamod working steam models. Precise in every detail. Engineering perfection in miniature. There's traction engine and steam roller with steering mechanism. Wagons to tow. And stationary steam engines. Prices from £2·45 from all leading toy shops.

Mamod

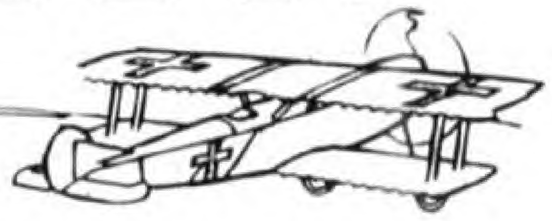
Malins (Engineers) Limited, Brierley Hill, Staffordshire

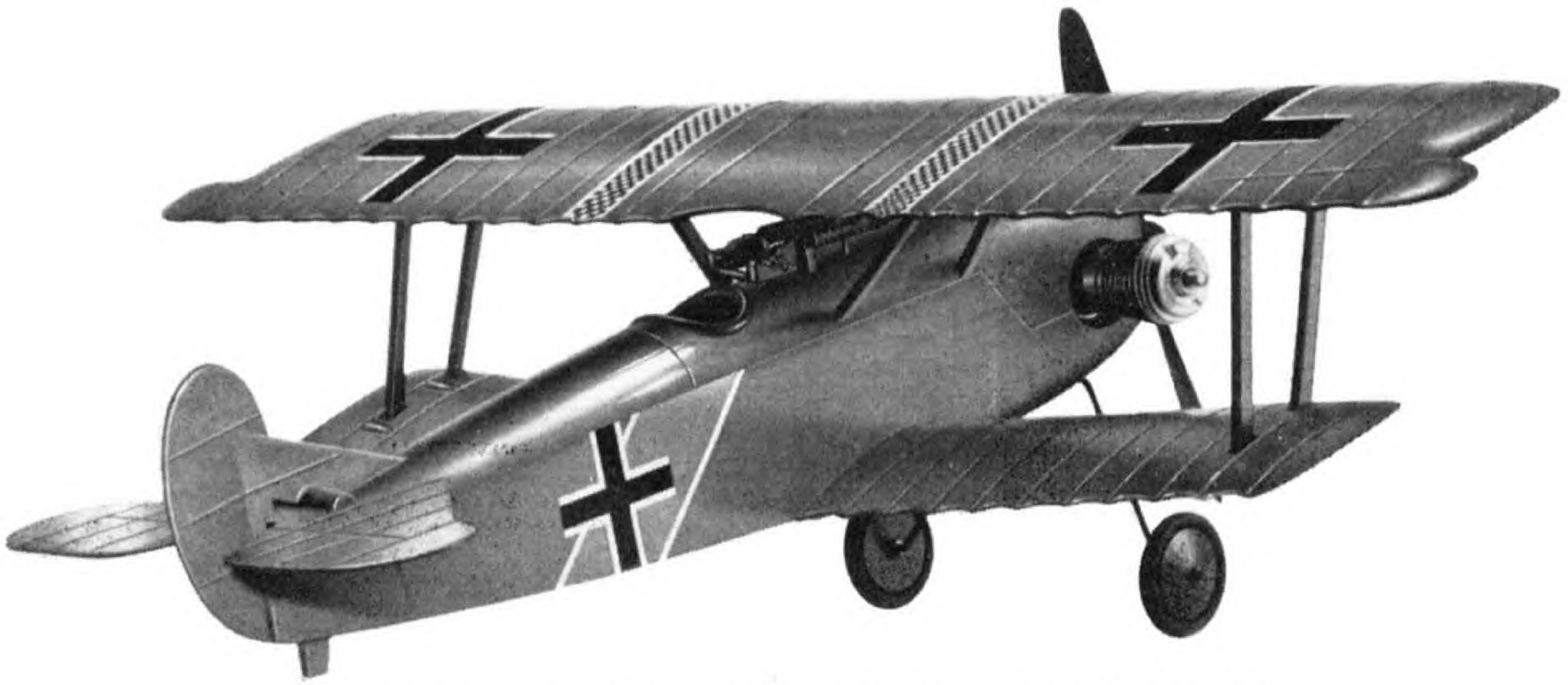
Be the envy of your friends
with this fabulous

FOKKER DV11

THE SUPER CONTROL LINE FLYING AIRCRAFT







Pride of the von Richthofen Flying Circus in World War 1, the Fokker DV11 is reproduced as a superb flying model. It features:

- **flying circus type decor**
- **"wood" grained prop**
- **rugged wing struts**
- **simulated machine guns**
- **13" wing span**
- **powered by the famous Cox .049 engine**

£7.95

AVAILABLE FROM HAMLEYS AND
ALL GOOD TOY AND MODEL SHOPS

CONTACT

A.A. HALES LTD. P.O. BOX 33 HARROWBROOK ROAD
HINCKLEY LEICESTERSHIRE TEL: HINCKLEY 4746 (3 LINES) TELEX 341316

KINDLY MENTION "MECCANO MAGAZINE" WHEN REPLYING TO ADVERTISEMENTS

An Important Notice



ON THE EDITOR'S DESK

AFTER five interesting and enjoyable years, we at M.A.P. must now say goodbye to readers of Meccano Magazine. It is planned that Meccano enthusiasts will continue to be catered for by Meccano (1971) Ltd., but we, as an independent publishing organisation, have found it necessary to relinquish editorial responsibility for the M.M. and this is in fact the last issue to come off our presses.

The decision has been taken—reluctantly—at a time when interest in and sales of Meccano are more buoyant than for some years. The magazine has always appealed to lay readers, in and out of the publishing world, more strongly than any other of the specialist publications in the M.A.P. stable. Nevertheless, even the large core of Meccano enthusiasts prepared to spend 15p a month on a journal covering their interests is not sufficiently large to sustain an independently-published magazine in these days of ever-increasing wage bills and costs. The reaction of almost everbody who has read the magazine has been to heap praise upon it as an extremely readable and interesting publication, but this interest has unfortunately not persuaded those readers to place a regular order. Meccano enthusiasts have always given their whole-hearted support, but the volume of additional support has not been sufficient to make the magazine a viable proposition from the point of view of a publishing organisation such as our own.

Possibly there exists a magic formula which would enable such a journal as this to make headway against the tide of price increases, but if so, we have been unable to find it. Naturally, we have explored all avenues which our considerable publishing experience has suggested might lead to increased sales and/or revenue, but in each case our researches have been fruitless. What we can claim is that we, with the backing of Meccano Ltd., have extended the life of the magazine for five years since it was closed down as lacking viability by the previous publishers in 1967.

Meccano Magazine Quarterly

Although the Meccano Magazine, in its present form, ceases with this issue, the interests of Meccano modellers are reverting to the "Home of Meccano"—Binns Road, Liverpool. Subject to the interest of existing readers, Meccano (1971) Limited have plans to publish from Liverpool a quarterly journal entitled "Meccano Magazine Quarterly" which will be devoted exclusively to Meccano matters. This is not intended to be a Meccano advertising platform, but could be equated with the Meccano-sponsored editorial section of the existing magazine; new models will be described, "Among the Model Builders" will continue to appear, items of Meccano news will be reported—in short, *it will be the Official organ of the Meccano hobby*.

At the present time it is planned that the *Meccano Magazine Quarterly* will be published in March, June, September and December of each year and will initially consist of a minimum sixteen pages, similar in area to the existing magazine, with additional pages being included from time to time.

The magazine will be available direct from Meccano on a subscription basis only and an initial costing indicates that the yearly Subscription Rate will be in the region of 75p. It will be produced as a non-profit-making service to modellers and thus, if reader support is sufficiently high to result in a profit, then this could be returned to the readers in the form of additional pages.

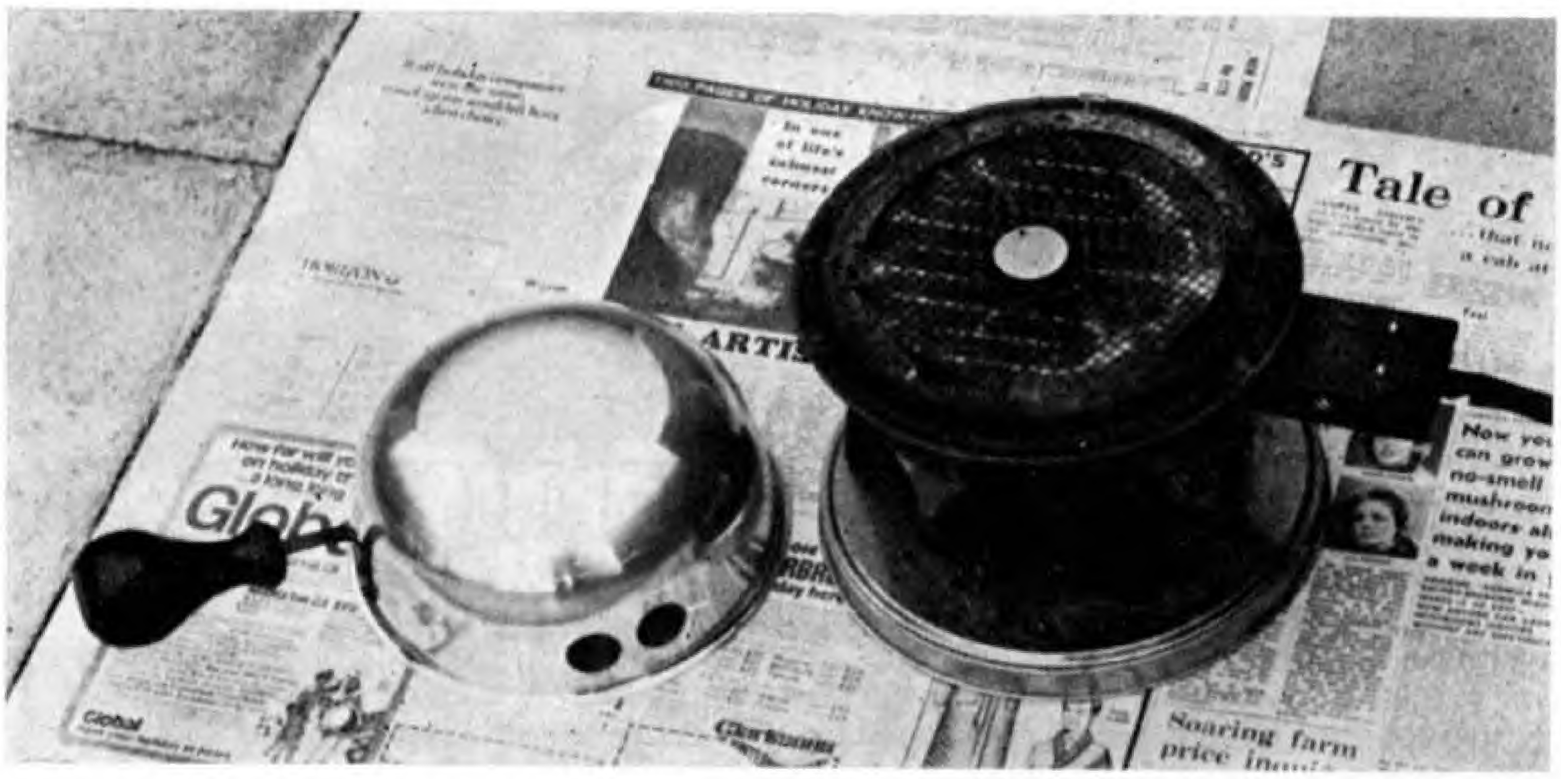
Elsewhere in this issue you will find a pre-paid reply form which all readers interested in receiving the *Meccano Magazine Quarterly* are asked to complete and return to Meccano (1971) Limited. It must be stressed that this is *not* a form committing the sender to a subscription, but is simply an effective way of enabling Meccano to gauge the interest in the proposed M.M.Q. We therefore strongly advise all Meccano enthusiasts with a genuine interest in the continuance of their magazine to show their support for the new publication by returning this form as soon as possible.

Returning the form does not at this stage place the reader under any obligation to subscribe.

Existing Subscribers

Although this is the last issue of Meccano Magazine in its present form, we still have a number of existing readers whose subscriptions have not yet expired. Such subscribers may have the balance of their credit transferred to Meccano (1971) Ltd. to be set against future copies of the *Meccano Magazine Quarterly* if they so wish. Alternatively, their balance may be transferred to any other M.A.P. magazine, or it can be used to purchase M.A.P. books. If preferred, a cash refund will be made.

We ask outstanding subscribers to contact us at M.A.P. with instructions on how we are to attend to their credit balance. In the absence of any request to the contrary the balance of outstanding subscriptions will be transferred automatically to the new publication. In the meantime, we would like to wish Meccano whole-hearted success with the M.M.Q. and would like to sign off with a sincere "thank you" to all the readers who have supported us throughout the past five years.



ENAMELLING

Real enamelling, that is, with powdered glass-type fused-on enamels

M.M. staff examine a simple commercial outfit

THOUSANDS of people in the last three or four years have been discovering the pleasures of enamelling. Real enamelling, that is, in which copper is coated with molten glass in any colour or colour combination and pattern. What had brought this fascinating hobby into the reach of so many is the availability of a simple and inexpensive kiln; a kiln is necessary since the temperature required to make the glass flow is around 800 deg. C.

A basic kit consisting of kiln, an assortment of copper blanks, half a dozen phials of powdered enamel, jewellery "findings", oil and brush, a handling spatula, solder, asbestos sheet, and abrasive paper, can be had for £6.50. Packets of extra blanks, enamels in any colour, glass rods, glass lumps, and a whole host of other accessories are available relatively inexpensively. The beauty is that apart from the fun of doing it—and everyone who sees it wants to have a go—a pendant, or a ring etc., can be made at a cost of perhaps 8 or 10p, and sold for anything from 25p upwards, so that the cost of the kiln and accessories can be recovered quite easily. Of course, the things made are also most acceptable presents, so that the enameller not only enjoys doing it but gives pleasure to others and can also cover his costs.

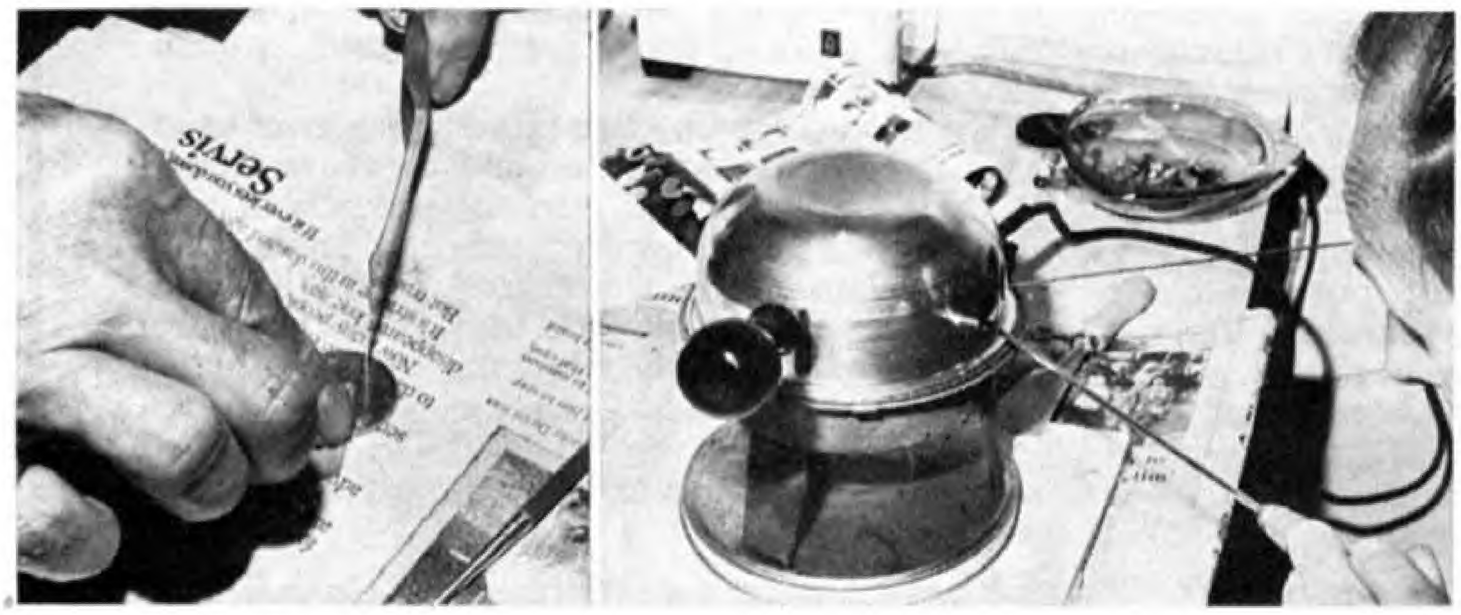
Most of the products are likely to be jewellery—pendants, earclips, cuff-links, rings, and so on—at least in the early stages. More experienced enthusiasts can make enamelled belts, buckles, bracelets, and the like, and go in for very artistic effects, cloisonné work, etc. The kiln people supply such things as powder compacts (you enamel a disc to fit in the top) and square plates for decorative jewellery boxes etc. The potentialities are endless, and it is remarkably easy to produce attractive trinkets right from the start. Even 10-year-olds can do it and have fun.

The kiln plugs into any three pin electrical socket of 5 amps or over. It is rated at about 750 watts and so is not expensive to run. It takes about ten minutes to reach working temperature, so while it is warming up, the first job can be readied. Let's say we're making a pendant.

One absolute essential is that the copper blank is completely clean and grease free. For work at home, this is easiest done by thorough sanding with abrasive paper; we found carborundum paper, about No. 280, best. The fine scratches on the copper help to key the enamel in place. Sand until bright, and do not touch with the fingers afterwards, or grease will be deposited.

Place the blank on a sheet of clean paper (from an exercise book or similar), remove the cap plug of the phial of enamel, and tap the powder over the blank through the wire gauze already fitted in the phial. Tap the bottom of the phial to scatter the powder; move round the edge of the blank first, then cover the centre. The commonest fault is not putting enough powder on, so go over it all again to make sure it is covered. Carefully slide the corner of the thin metal spatula supplied under the blank, lift it gently, take the lid off the kiln, gently lay the blank in the centre, and replace the lid. It takes about a minute to "cook"; watching through the spyholes in the lid you will see it gradually become red hot, the enamel will appear to be rippled, then quite suddenly it is smooth. At this point lift the lid, slide the spatula under the blank, and move it to the piece of asbestos to cool. In some cases, the true colour of the enamel is not apparent until the blank has cooled.

Now examine the enamel for irregularities or thin spots. If desired, a second application can be made. The surplus powder left on the clean paper can be returned to the phial, by the way. Do not leave the blank



Above, a blank in place on the special kiln surface, awaiting covering with lid. Far left, cleaning a blank, avoiding finger contact. Left, scrolling with stainless steel tools.

in the kiln longer than necessary, or the enamel will start to burn round the edge.

Simple decoration can be achieved by scattering on powder of another colour, stirring it round with a wire, and refiring. Or you can drop a random selection of coloured glass threads on and fire. Tiny glass beads (make sure they *are* glass) will melt into circular spots, or "lumps" can be scattered on at random and will melt into irregular shapes. The oil supplied can be brushed over the enamel (when cold) to "stick" beads etc. in place, or it can be used to "paint" a design and powder then scattered on to stick to it. If you can draw, a white or very light colour enamel can be applied, then sanded thoroughly, and a design drawn with a soft black pencil. When refired this produces an attractive effect. Stencils or masks can be used to create other effects.

Perhaps the first step onward is to try scrolling. Here blobs of colour, lumps, or glass rods are allowed to melt completely into the base enamel and then stroked into whorls or scrolls with a heated wire tool. Usually one tool is needed to hold the blank still (with a pendant, the hole is a convenient spot) and the second used to stir the enamel. The tools have to be as hot as the blank, or the enamel solidifies on to them and sticks everything up—most frustrating!

The back of the blank becomes heavily oxidised and is covered with black "fireglaze". For a simple pendant, this has to be sanded off to bright copper, as does the edge of the blank, polished, and then the cleaned areas given a coat of clear nail varnish. For a more elaborate job, it is best to counterenamel, which simply means applying a coat of enamel on both sides of the blank before putting on the decoration. To do this you need a trivet, because obviously when heated you have melted enamel on each side of the blank. The trivet supports the blank at three (or four) tiny points of contact right at the edge. The procedure is clean back of blank, enamel as described, cool, clean front of blank, powder, then pick up and set on trivet. Lift trivet into kiln, fire, lift trivet out and cool. Replace blank on trivet for each subsequent firing.

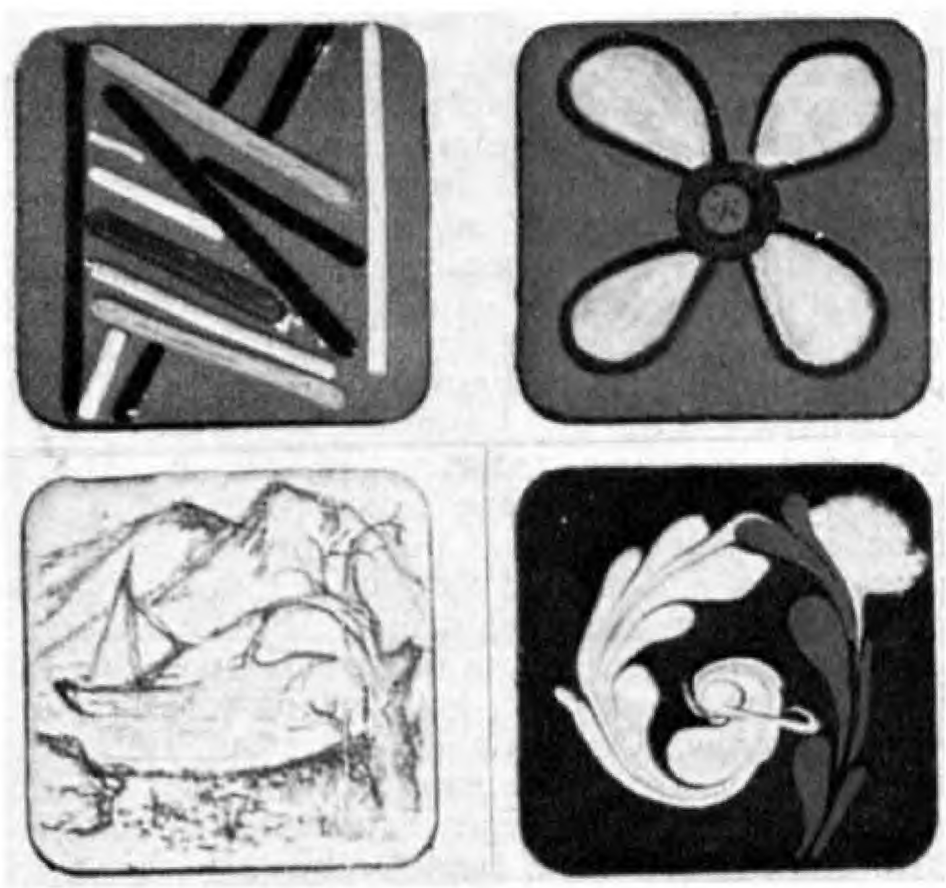
To solder a finding—a ring or cuff-link mount—to a blank, the enamelling is first completed on the front. The back of the blank is then thoroughly sanded off and the blank placed enamel side down *on top of the kiln lid*, i.e. outside. In a short while the solder can be briefly touched on it and will form a small pool. The finding, with its soldering face thoroughly sanded, can be placed on the solder, positioned accurately, then the assembly lifted carefully off and allowed to cool. The heat on the kiln lid is ample for good soldering but not enough to affect the enamel.

Cloisonné work involves dividing off the enamelled areas with copper wire, filling the shapes formed by the wire with different coloured enamels, then polishing up the wire to produce a pleasing effect.

We hope that in this necessarily brief outline of this craft we have managed to convey some of the fascination it holds. It is so simple to produce pleasing results, yet as one's skill develops there are so many possibilities to investigate. It is not unusual for people trying for the first time to be up till 2 or 3 a.m., just not able to leave it alone! It is something for the whole family to enjoy, even the non-artistic members, and it is certainly a fine answer to the Christmas present problem.

Further details of kilns (including larger ones) and accessories etc. are available from Enamelaire Ltd., 61b High Street, Watford, Herts. This company also supplies candle making equipment and many other craft products. More information on enamelling can be found in your local public library.





Top, a dusted blank ready for firing. Enamel phials are visible. Above, glass threads, simple cloisonne, pencil sketch, and scrolling effects, from colour illustrations supplied with the kiln. Below, soldering a ring on top of the kiln lid.





The First Motion Pictures

by Charles A. Rigby

THE DEVELOPMENT of the cinematograph or ("kinematograph") of yesterday far exceeded public imagination, and after the early years of trial and experiment it was universally accepted. Inevitably, the introduction of the "Magic Lantern" some years ago gave it an impetus, since inventors began to realize that something more real than projected pictures from colour slides was needed. Incidentally, the first photographic analysis of motion was made by Edward Muybridge in 1872, and this perhaps was the first lesson in "animated" pictures.

In 1893, Edison's assistant, W. K. L. Dickson, invented the "Kinetoscope", consisting of a small cabinet in which a film was put in motion by hand or motor power, and viewed through a magnifying glass. He also made the first sound film. Bit by bit, motion pictures became a reality, an important step being made in 1891, when the daylight-loading film was introduced by the Eastman Company of America. Edison and his assistant used the Eastman film for their "Kinetoscope". Celluloid was originally used as the material of films, but owing to the considerable fire risk a non-inflammable film made from cellulose acetate is now in use.

From 1895, cinematography or "animated" pictures had caught on in various countries. From America, the new entertainment spread to Britain, France and other countries including South Africa and Australia. In Paris, during December 1895, the first public film show in the world, an exhibition by the Lumière brothers, showed the flickering crowds coming out of a factory. During the show, one member of the audience, Georges Méliès, thought his payment of one franc was well spent. In the middle of the show, he sprang out of his seat and bid 10,000 francs for the new machine. Then he raised the offer to 50,000 without success. "Young man," said the inventor sternly, "My invention is not for sale, you ought to be grateful for it would certainly ruin you. It may be exploited some day as a scientific novelty, but beyond that, it has no commercial future." Georges Méliès seemed to be fascinated with the new invention and went into movies. He was the first man to realize the fascination of celluloid, the first film director of genius. He was 34 when he saw that first "movie". He saw at once that the new invention was everything he had been waiting for. He opened a little cinema to show Edison's early films. The greatest thrill was to see a railway train belching smoke or a regimental march-past. Seven years before the Great Train Robbery of 1903, the first feature film, starring Mae Murray, Méliès plunged into production himself. In 1896 he opened the first film studio in the world, behind his house at Montreuil.

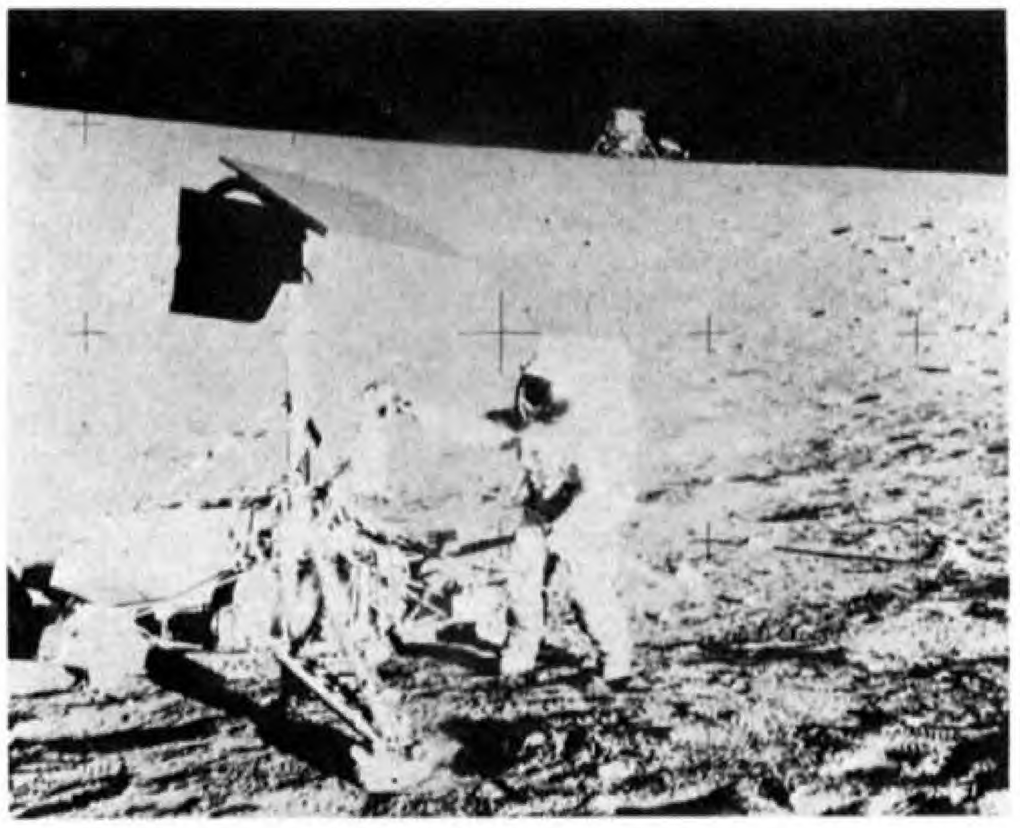
The very first "animated" pictures were seen in South Africa by a group of leading business men and journalists in Johannesburg on April 4th 1895. Edison's "Kinetoscope" was shown to President Paul Kruger, and soon after many people were given the opportunity of seeing Carmencita dancing, two roosters fighting, and Buffalo Bill (Col. Cody) shooting at a target with a rifle. A few months later, S. Africa was one of the first countries to see "Sound Films", when Lingard's waxworks in Durban acquired a "Kinetoscope". When shown in Cape Town, early in the following year, 2,000 people attended the opening night.

The magician Carl Hertz decided early in 1896 to visit South Africa. Just before his departure from London, he virtually "stole" a projector from Robert Paul who did not want to sell one of the two he used in a music hall. Hertz's pleas were useless but the night before his departure, he simply unscrewed one and slipped a good sum of money into Paul's hands. En route to S. Africa, aboad the ship "Norman", he gave the very first film performance at sea. A preview of "animated" pictures took place on May 9th 1896, in the Palace of Varieties in Johannesburg, and two nights later, followed the first public performance.

Five films—"A Scottish Dance", "Street Scenes in



Heading, tourists making a talking souvenir of a visit to the famous bridge at Avignon, using the Filmosound 8 system which tapes sound in exact synchronisation (*Photo Bell & Howell A.V. Ltd.*). **Left, Land-Rover mobile cinema has a generator for power source, optical sound projector, slide projector, record player etc. Used in the Congo for audiences up to 2000!** (*Photo Cintec Ltd.*).



One of the Apollo XII astronauts detaches the special lens assembly from Surveyor III which had landed previous to the LEM Intrepid seen on the skyline *(Photo Bell & Howell A.V. Ltd.).*

London", "Trilby", "A Military Parade", and "Tommy Atkins and his Friend in a Park", brought crowds to the Music Hall. Hertz visited various places and after that took the projected moving images to Australia. Edgar Hyman, manager of the Empire Palace, was so impressed by the new medium that he acquired a camera and acted as Correspondent for the Warwick Trading Company. The "Bioscope" projector and camera exerted such a powerful influence in S. Africa that the name "bioscope" is still used in contrast to "movies". By 1913, however, a chronic situation in film distribution developed because of so many competitors.

With the introduction of cinematography into Britain, this at once became a popular form of entertainment. Many people will remember the names of various companies who regularly supplied outstanding films, including Vitagraph, British Biograph and Mutoscope, Columbia Pictures Inc. and Pathe News Reels. Many of the American films depicted the early life of the Settlers, the Red Indians, and the Cowboys. Together with the various "comics" starring Charles Chaplin, Laurel and Hardy, and others, these laid the foundations of the films. Later, films based on well-known novels, as "Uncle Tom's Cabin", and "The Last Days of Pompeii", were favoured. Today, films are more futuristic and even include those based on "Space Travel" as in "The Planet of the Apes."

The first film cameras used were invariably fixed on tripods during use. The famous Thomas Alva Edison's Company was one of the groups who staged their own "Boer War" with actors dressed as British soldiers and Boers. During the actual war, three camera-men, Edgar Hyman, W. K. L. Dickson, and Joseph Rosenthal were engaged.

The first projectors used for showing films were also of simple design. In that invented by Carl Hertz, the films were driven not by motor, but by hand, by means of a cord riding on two wheels. The form of illumination for projection on the screen was also primitive. Nowadays, more powerful light sources or "lamps" which give a brighter and whiter light, such as the "Tungsten Halogen," are used.

In the moving picture camera of today a narrow sensitized film is made to pass in intermittent motion behind a focused lens, and is held stationary for a brief period while the exposure is made, after which the exposed portion is wound on to a spool and a fresh portion comes into place behind the lens. Pictures are taken at an average rate of about 20 per second. A positive film made from the photographic negative is passed between the condenser and lenses of the projecting lantern, in such a way that the film halts for a fraction of a second, while each separate picture is thrown on the screen. In other words, the picture is projected on the screen at from 15 to 24 frames per second, as with TV. A powerful electric lamp is the illuminant and to protect the film from the great heat generated, an automatic cut-off shutter comes between the film and the lamp when for any reason the machine stops running. The mechanism for moving the film is actuated by an electric motor. To guard against the danger of fire in theatres the projector is housed in a fire-proof chamber.

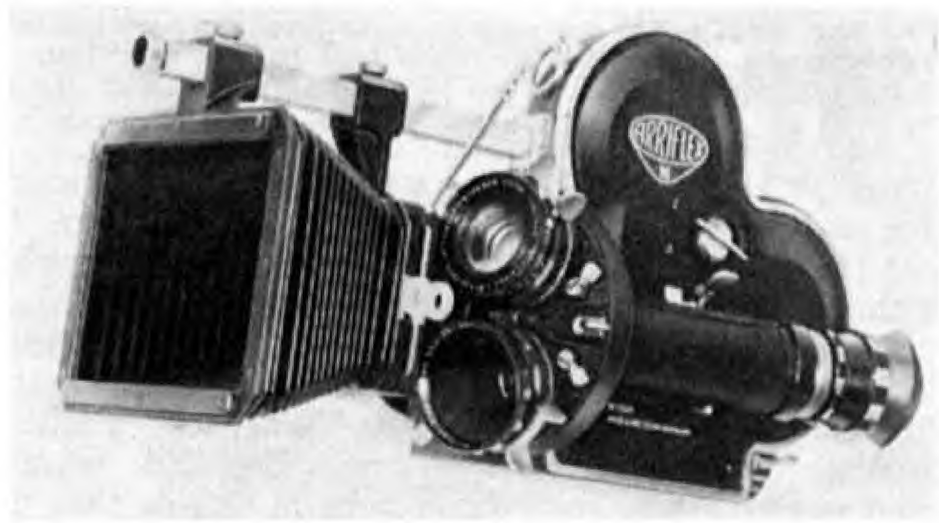
The first important advance made in the reproduction of colour on the screen was in 1906 when Charles Urban and G. A. Smith patented "Kinemacolour". During photography, and projection, alternate red and green filters were passed before the lenses, suppling a realistic if not always accurate colour. Biocolour, an

Below left, 1965 projector lamp, 300 watt quartz-arc type. The bulge is the arc chamber. *(Photo General Electric Co., U.S.A.).* **Centre, the film is never handled in this Super 8 projector, which uses a plastic clip-on cassette and automatic threading. Right, modern application of the cinema; six cinemas are installed in each Pan-Am Jumbo-jet. Cowboy fans may recognise one-eyed sheriff as John Wayne in "True Grit".**









The Arriflex 16 mm. cine camera, a modern camera for normal usage. (*Photo Rank Audio Visual Ltd.*).

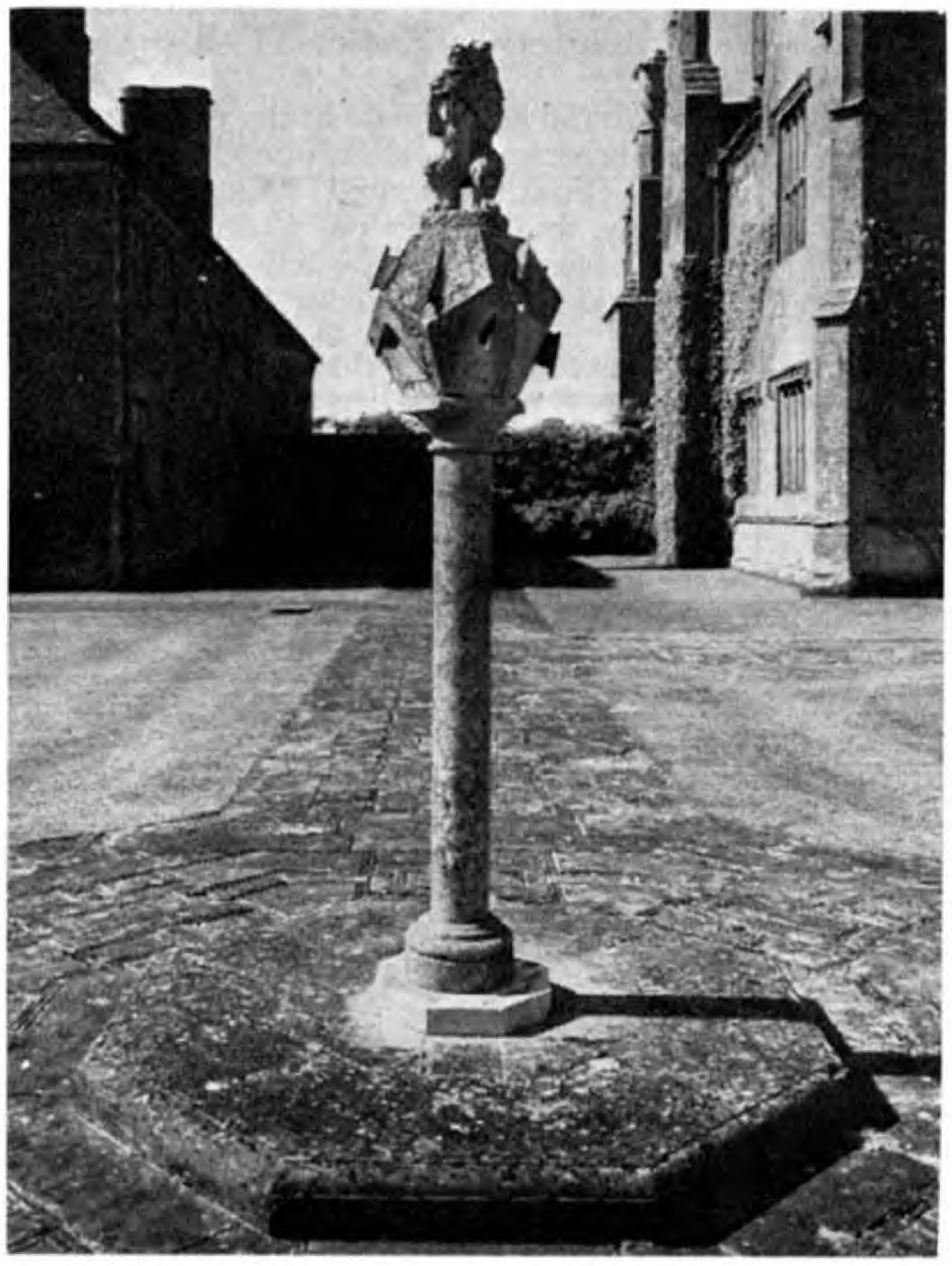
imitation, was later invented by Friese-Greene. Technicolor was begun in 1915, when a team of US physicists, with a first step to improvement, used a prism to split the light into two parts—the Red-Orange end of the spectrum, the other the Blue-Green. Each image was captured simultaneously on a separate band of film. The two strips were then developed and printed after which they were passed through their appropriate dyes. When laminated together, they produced a reasonably faithful reproduction of natural colour. Use of the "Wide Screen" changed all this with the adoption of full-colour mono-pack processes, thus superseding Technicolor.

By 1920, "Talkies" rivalled silent films. In one method, a sound record is made on a wax disc during photography and a permanent record prepared from the wax original is passed through a gramophone device during projection, sound record and picture being carefully synchronized. In the sound-on-film system sound vibrations picked up by the microphone cause variations of intensity in a slender beam of light directed upon a narrow band at the edge of the sensitive film negative.

During projection, the sound record on the edge of the film interrupts a constant beam of light shining through a narrow slit, and so produces electrical variations in a photo-electric cell, where they are amplified and converted into sound vibrations. In the two-film system, a separate film is used for the sound record which is made to produce variations in an electrical circuit to work a loudspeaker. Standard sizes of films are in general use.

The Science of Sundials

by E. V. Malone



THE configuration of sundials has come a long way since the earliest and simplest ones were invented by the Babylonians over four thousand years ago as the human race's first recorder of the passing of that most fleeting of substances, Time. It is generally agreed among scholars that the device reached the shores of Britain from the East by way of the Mediterranean countries and the first were installed on the south walls of churches in order to indicate when the service was due to begin.

These "scratch dials" or "mass dials", consisting principally of a peg surrounded by a few marks, contrast sharply with the most up-to-date sundials, which vie with the most expensive clocks and wristlet watches! In addition to the village church, the village green was in bygone days a favourite site to erect the sundial and today remaining ones provide cyclists and lovers of history with an excuse to rest a while to examine their operation and construction.

The principle of this sundial, of course, is that an upright projection known as the gnomon or stylus, whose other angle is equal to the latitude of the place where the the sundial is situated and parallel to the earth's axis, casts a shadow on a plane surface on which the respective hours of the day are inscribed.

What any sundial shows is apparent time, that is the time as indicated by the position of the sun in the sky. Unfortunately, because of complex astronomical causes the sun is a rather uneven timekeeper and we cannot set our watches or run our lives by it. The maximum

A ten-faced sundial, to give more accurate time, can be seen at Barrington Court, near Langport, a National Trust property.

difference in Time between an accurately-built sundial and a clock is 16 minutes, which circumstances occur for a few days in November. This divergence is called the Equation of Time and referred to on calendars as clock-fast or clock-slow.

The various kinds of sundials are generally named according to the position any particular example occupies. Firstly, there are Vertical dials, when traced on a vertical plane facing one of the cardinal points; secondly, Horizontal dials when on a horizontal plane, and, thirdly, Equinoctial dials when the plane is at right-angles to the earth's axis.etc,

Down the centuries sundials have had their ups and downs. The most flourishing period in the industry, however, came in the sixteenth and following century, when so assiduously did the makers regard their work that the science was a branch of its own called Gnomonics. Beautiful instruments in that era were completed on pedestals specially for gardens, including some for the palace gardens of King Charles I.

Apart from the obvious drawback that to be of any practical use the sun must be shining, the sundials made were large and clumsy and useless if a person was travelling. This difficulty was partly overcome by making pocket instruments which allowed for a correction to be applied when carried from place to place, as well as erecting them on the windows of houses in such a way as they could be read indoors. The latter type are very rare nowadays, although a particularly attractive stained-glass specimen has survived at Nun Appleton Hall, a mansion near Tadcaster, Yorkshire. The handiwork of a local glass-painter, one Henry Gyles, it is illustrated with a cupid (beautiful boy) in five different poses and can be seen over the south door.

Another innovation were dials to indicate the Time simultaneously at different cities, such as are preserved at Eyam, Derbyshire and Isleworth, Middlesex. Even better was the creation of multi-sided instruments to catch the fleeting appearances of the sun, as at Steeple Ashton, Wiltshire (4 faces), Barrington Court, Somerset (10) and Castleton, Isle of Man (13). These intriguing sundials were surpassed by a twenty-sided instrument which may be seen at Walton Hall, a mansion on an island in a lake near Wakefield, Yorkshire. This curiosity was fashioned in 1813 by a mason, one George Boulby in the village of Crofton, who studied the works of Plato in his spare time and wished to prove his theory that any solid sphere consists of twenty equilateral triangles. When Charles Waterton, the famous naturalist, saw it in the stone-cutter's yard when hunting, he bought it for his stately mansion. It registers the correct time for twenty cities throughout the world.

Some sundials were so constructed to act as moondials as well, for example, the specimen at Queen's College, Cambridge, which was erected in 1733 and from which the age of the moon can be read in addition to the time to be added when the instrument is read by moonlight. At Corpus Christi College, Oxford, there is a variation in that the moondial is placed below the sundial, each being as it were independent of one another.

A variety of mottoes and original verse were inscribed on sundials, and range from the verse of 'Now or Never', 'Time is Short', 'Begone about your Business', 'Thou seest the Hour, but knowest not the Hour'. In this connection guests of the Queen at Sandringham are often intrigued to read the captivating couplet on the sundial there. It runs

'Let others tell of storms and showers,
I'll count only your sunny hours',

an almost identical copy of which accompanies the dial on



Largest sundial in Britain (above)? At Seaton Ross, E. Yorks. Below, the Sun & Moon Dial at Queen's College, Cambridge. Tells time by sun or moon, age of moon, signs of zodiac through which sun is passing, etc.



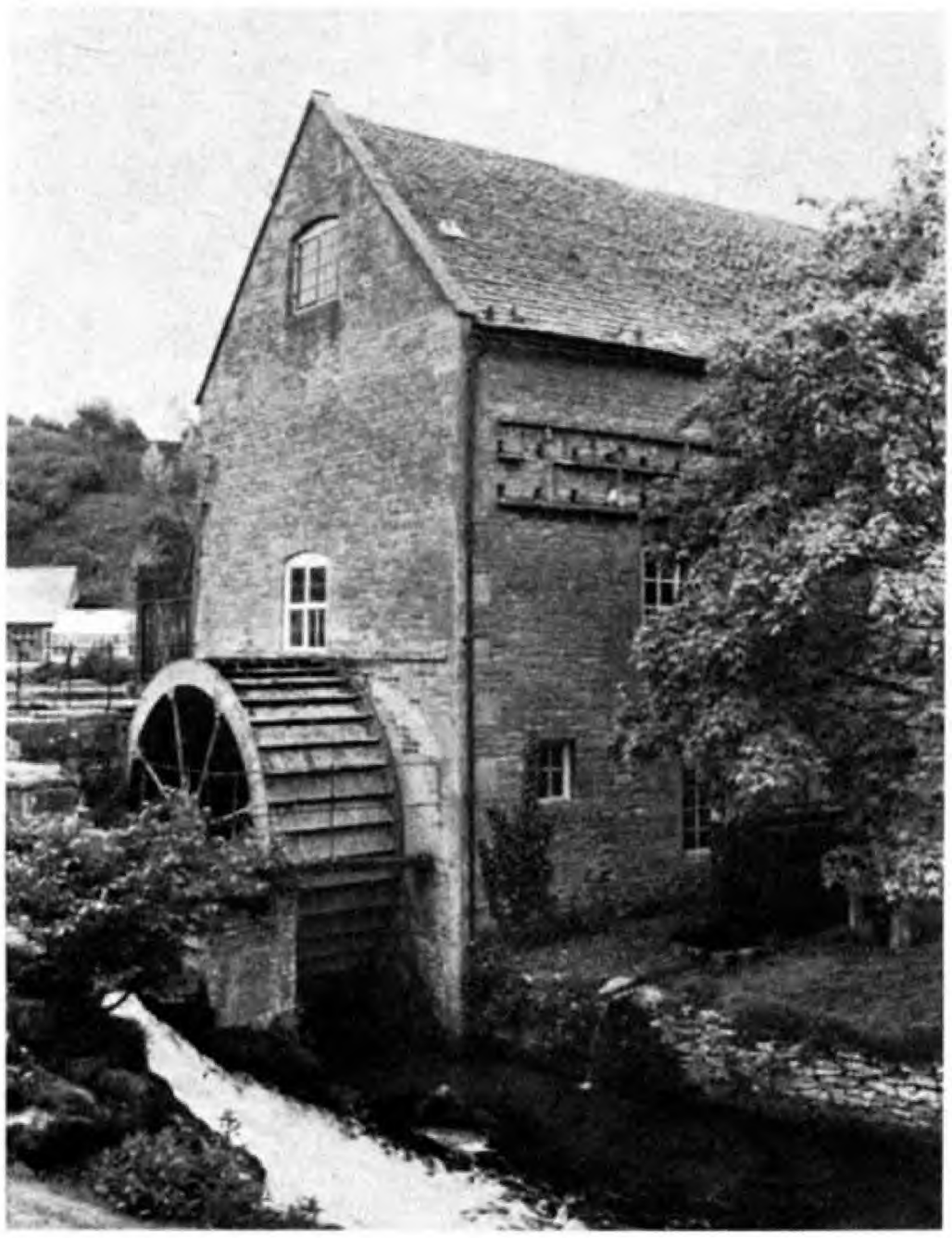
a house at Holmwood, Essex. A more common adaptation is the verse:

'Serene I stand among the flowers,
And only count the sunny hours.
For me dark days do not exist,
I am a brazen-faced optimist'.

Ever since the invention of the mechanical clock in the eighteenth century, sundials, of course, have taken a back seat. But what more appropriate idea could have been thought of than to install them as memorials to famous people or events? Every county has its own quota but outstanding are those to Lawrence of Arabia at Bridlington, Yorkshire, Thomas Hardy, the novelist, at Dorchester, Dorset, King Robert the Bruce at Girvan harbour, Ayrshire, when "he held court and granted charter to the friars of Ayr in 1328", and one near Chippenham, Wiltshire, perpetuating the public-spiritedness of Maud Heath in constructing a four-mile causeway over marshland in the fifteenth century, for the benefit of travellers.

Certainly the most ingenious in this category is the example to be seen on a column in Pett's Wood, Kent, in honour of William Willett, the man who was responsible for the Summer Time scheme which was adopted by Parliament in 1916 and to which we have now returned, grateful for the extra hour of daylight in the summer evenings. This dial was so constructed to register the time as Willett himself would have doubtless desired.

Sundials may have outlived their usefulness as accurate time-keepers in this age of exploration of outer space when chronometers and computers are the order of the day. Nevertheless, they are still being made, proof if it were needed that these relics of long vanished centuries linger on to fascinate many by their beauty, originality and novelty, if nothing else.



DONNINGTON BREWERY

BY E. G. HODGKINS

THE Cotswold Hills provide some of the most beautiful spots in England and visitors to the area never cease to wonder at the variety of unspoiled places that abound there. Once in a while, however, a real gem may be found, putting most of the well-known places in the shade. Just such a gem is the Donnington Brewery near Stow-on-the-Wold.

Three centuries ago, a woollen mill was built beside the village of Upper Swell in a beautiful secluded hollow, close to the source of the River Dickler. This little river provided both power for the mill and clear water for washing the wool. Later, the buildings were to become a cornmill and then a bakery until, in 1865, they were purchased by Mr. Richard Iles Arkell, a member of the family of brewers who still run the Arkell Brewery in Stratton St. Margaret, near Swindon, in Wiltshire.

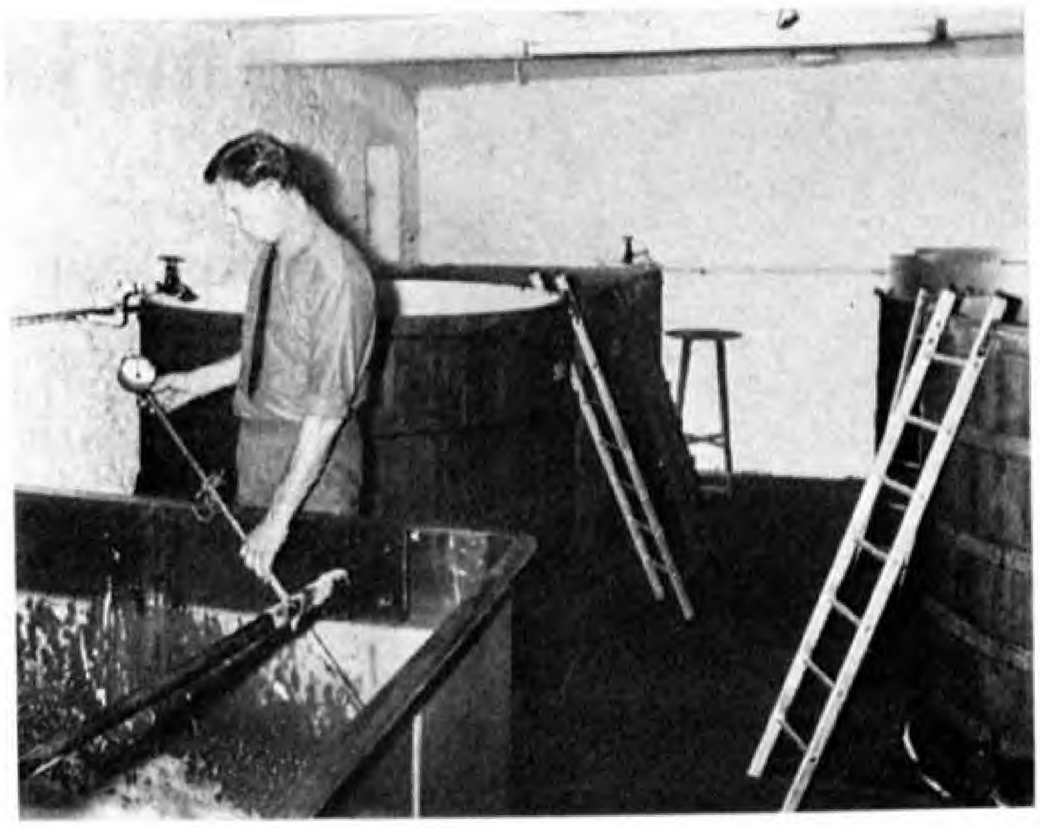
Richard was a shrewd young man, who realised that the pure water of the Dickler, with just the right amount of 'hardness' (it contains magnesium and sulphates similar to the famous waters of Burton-on-Trent, Munich, Pils and Prague) was perfect for the brewing of Arkell's beer. The present owner of the brewery, Mr. Claude Arkell, is the grandson of the founder, and still brews his ales using the same age-old techniques.

The Brewery owns seventeen public houses, all within fifteen miles of Stow, and supplies three different ales exclusively to them. Mr. Arkell knows their consumption and can supply freshly brewed beer to every one of them as required. The customers know that they can't obtain this quality brew anywhere else—and it doesn't cost any more than other beers. They also



The idyllic surroundings are shown in the view of the brewery on the right. Above, one of the two 100-year old water wheels still in use.

The brew temperature being checked by Mr. Claude Arkell in the fermenting room.



maintain that Donnington Ale does not leave a hangover!

With the staff of six full-time workers and two part-timers, Mr. Arkell uses an old family recipe to produce his three brews—two bitters and a mild. He produces 50–60 barrels a week (a barrel is 36 gallons) and about two thirds of this is draught, the rest bottled. He was happy to show me round his brewery (though he reluctantly has to refuse casual visitors because his time is so fully occupied in satisfying a thousand thirsts). Two water-wheels, each a hundred years old, take it in turns to pump the water from the brewery's own spring. These must be among the last water-wheels in the country still employed to do a useful job of work, but Mr. Arkell admitted that, with the recent introduction of a new bottling plant, the old pumps have had to be reinforced by a motor driven pump as their output was no longer enough.

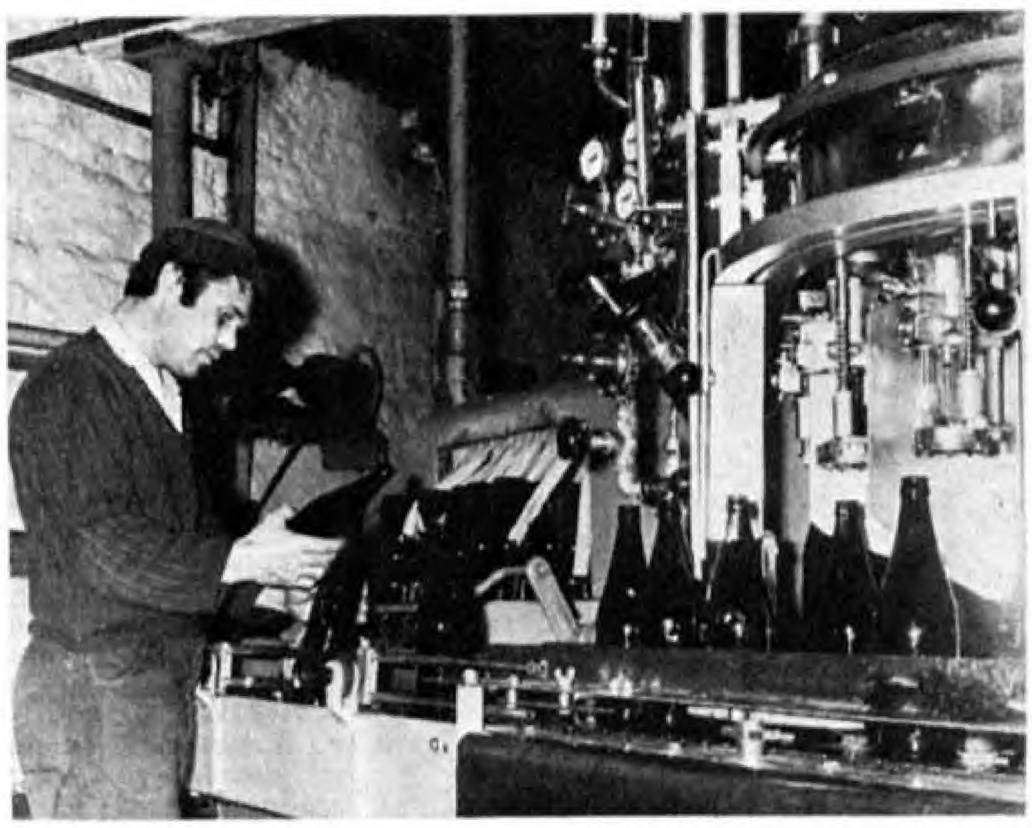
I saw the beer being brewed in great vats, each containing 600 gallons. (The giant companies produce 4,000 gallons in a single batch.) Here the starch in the malt is converted into sugar by the "mashing" process, taking about a day. I had a sip of the brew after this stage and its taste left a lot to be desired! Next the brew is cooled and passed into fermenting vessels, where it spends a week while the yeast does its work of turning the sugars into alcohol. Finally, the ale is filtered and bottled or casked as required. The strength of the brew is regularly checked by Customs and Excise officials (to ensure that the local farmers can still plough a straight furrow?) and the water analysed by public health authorities, to check that the waters of the Dickler are still as pure as always. In addition to his own beers, Mr. Arkell also bottles 30–40 barrels of Dublin Guinness each week, for distribution around the Cotswolds—a welcome contract to help pay for the expensive bottling plant.

The brewery has its own 300 acre farm, and used to grow all its own barley for malt. It now proves more economical to sell the crops for foodstuffs and buy malt, ready made, from a company in Cirencester. The hops are bought from Worcester and the yeast is self-producing, being a living organism that feeds and grows during the fermenting process. Most of the staff live in houses built on brewery land and Mr. Arkell and his wife have a very attractive stone house converted from the old stables. The house and the brewery look out over the huge, clear mill pond that is home for about 25 different types of duck and wildfowl—these are Mr. Arkell's pride and joy, particularly a very fine pair of black swans. This is a small piece of Paradise where it must be difficult, on a sunny day, to feel like work.

The precious brew is delivered to the public houses by the brewery's one lorry and one van, both of which are fully occupied running backwards and forwards around the narrow, twisting Cotswold lanes. The van is used for deliveries to one or two of the pubs which are so inaccessible that the lorry cannot easily get to them. Before the days of motor transport, it was a hard day's journey transporting the ale to places like Winchcombe (twelve miles away over the hills) by horse and cart.

Beer was made in ancient Babylon. The Romans were disgusted at the drunken Britons who had found a way to turn water into alcohol. 75 years ago, there were 16,798 brewers in Britain and now there are only about 300 as the big companies take the small ones over. The old "home brew" with its distinctive quality is becoming harder to find, but the locals hope that Mr. Claude Arkell will long resist the offers of the giants to part with his seventeen houses and deprive them of Donnington Ale for ever.

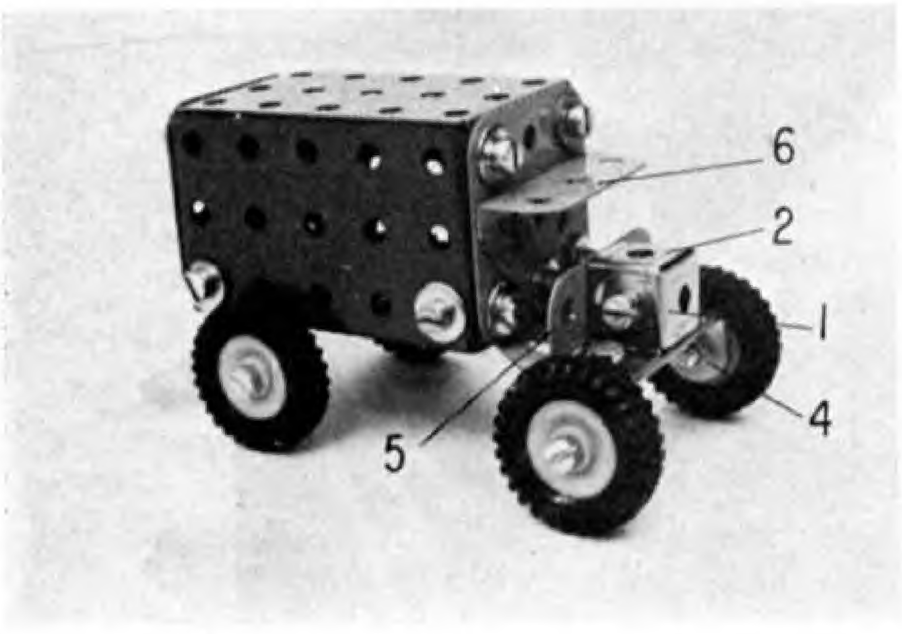


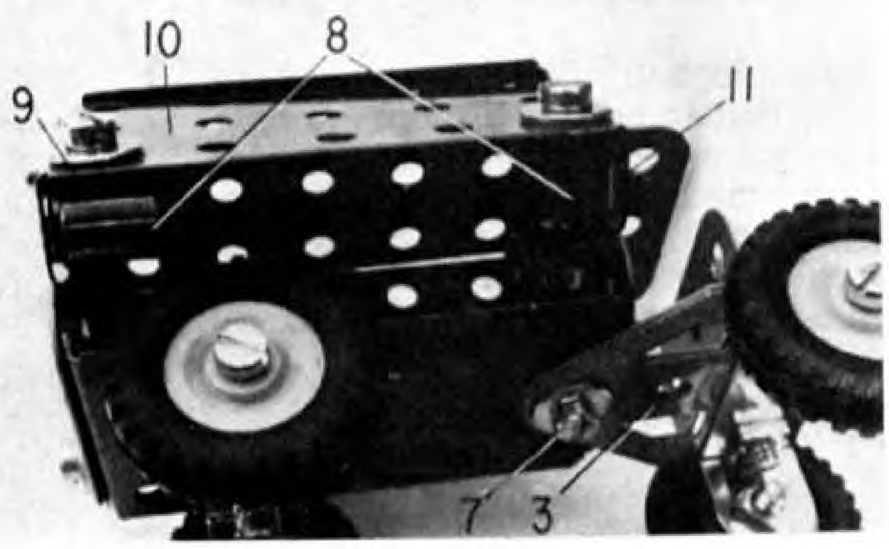


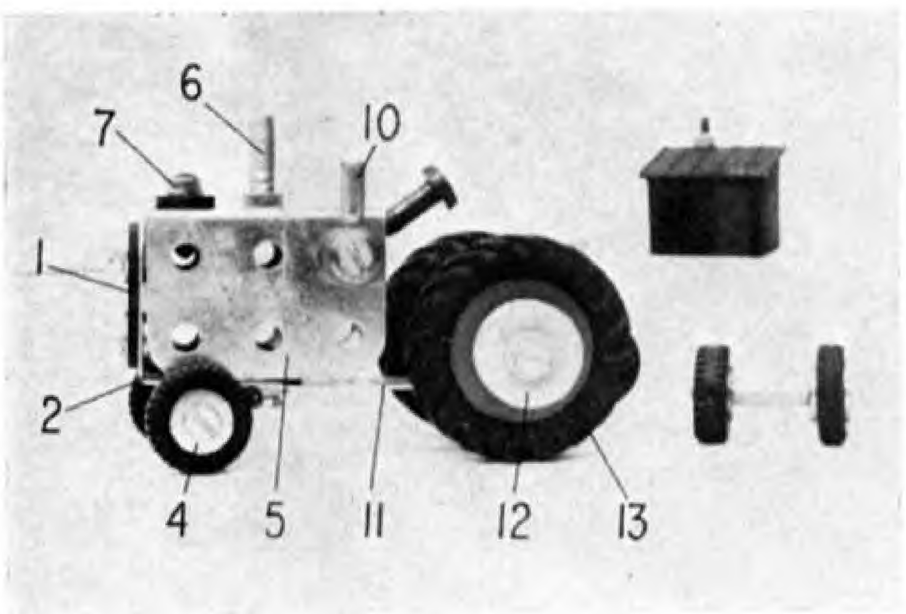
Top, empty casks in racks in the store, those on the floor are full, ready for delivery. Right, part of the modern bottling plant.

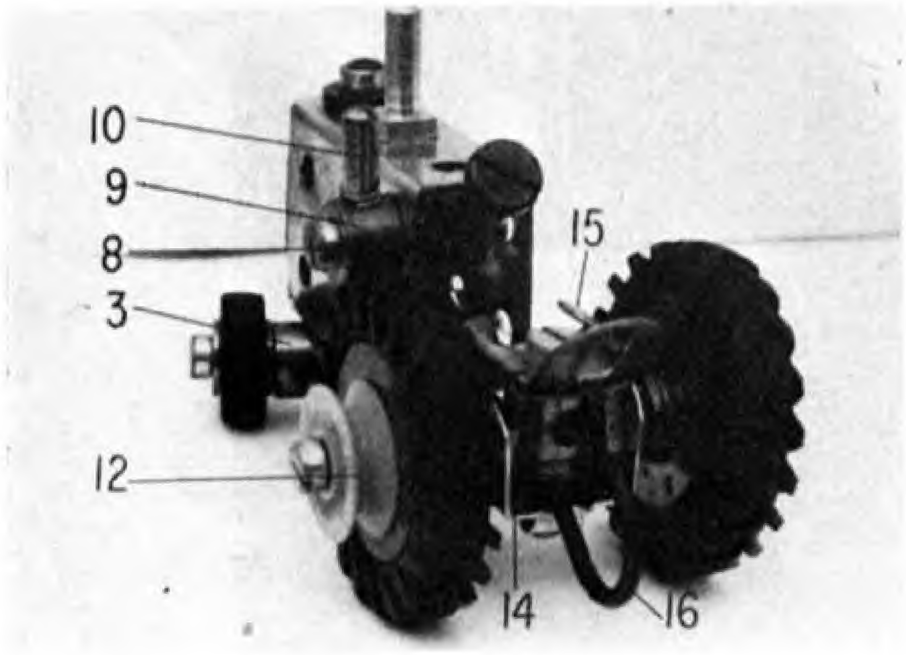
New Ideas for 'Tyred' Models

By Mike Nichols









Top to bottom, Fig. 1, a Butcher's Wagon based on that featured in the T.V. series "Dad's Army". designed by Nigel Robb of Henley-on-Thames and fitted here with Dinky Toy Tyres, No. 093. Fig. 2, an underside close-up view of the Butcher's Wagon with the right hand side of the body hinged open to show the Threaded Bosses. Fig, 3. a simplicity model Tractor designed by the author and featuring rear wheels each built up from Dinky Toy tyre No. 087 fitted to a Plastic Meccano Pulley. The short Axle Rod alongside uses Dinky Toy tyres Nos. 020 and 086 which are similar in diameter but of different widths. Fig. 4, A rear view of the Tractor. Note the ½ in. Pulley 12 which gives a good representation of a winching hub.

THROUGHOUT Meccano's long history, one group of models have been constantly popular—the "simplicity" models, where the idea is to make a recognisable representation of the prototype with as few parts as possible. One of the main difficulties encountered in this type of modelling, however, is the representation of tyred road wheels and, in fact, as the smallest tyre in the Meccano system is for the 1 in. Pulleys, simplicity modellers do not usually bother with tyres at all, leaving the representation of road wheels to Collars, Washers, and ½ in. Pulleys, etc.

Meccano Ltd., however, do make a wide range of miniature tyres for the Dinky Toy series and, as these tyres are all available seperately, the Meccano engineer has at his disposal tyres to fit almost every circular Meccano part from the ½ in. Pulley down to the Collar, and for some of the larger parts as well!

The most obviously useful tyre is Dinky Toy No. 093, which fits the range of Meccano ½ in. Pulleys, as shown in Fig. 1 which illustrates a model of the Butcher's Wagon from the T.V. series "Dad's Army". The 093 is 1⅛ in. overall diameter.

Moving on to a larger tyre, the 087 is 1⅜ in. in overall diameter and fits the Plastic Meccano Pulley Wheel (Part No. P62). The road wheel thus formed runs freely on a "metal" Meccano Axle Rod if placed over a Collar (Part No. 59) from which the Grub Screw has been removed. The wheel is then sandwiched between two ¾ in. Washers (Part No. 38d) or, as in the case of the tractor in Figs. 3 and 4, a ¾ in. Washer and a ½ in. plastic Pulley Wheel (Part No. 23) which gives a good representation of a winching hub. Fig. 5 shows a demonstration unit with an 087 tyre on an axle, as detailed above, with the alternative method of fixing using a small Flanged Wheel (Part No. 20b) forming a very realistic recessed hub. This latter arrangement also facilitates firm fixing of the wheel to the Axle Rod.

Alongside the Tractor in Fig. 3 is shown an Axle Rod fitted with two Collars upon which can be seen two of the smaller Dinky Toy tyres. The wide example is No. 020 and the narrow version is No. 086, but both are similar in overall diameter at ⅝ in. These tyres are useful for the very small models which use Collars as wheels, such as the illustrated Tractor which itself uses 020's for the front wheels.

Moving up in size, we come to the 080 tyre, which is 1 9/16 in. in overall diameter and fits the Socket Coupling (Part No. 171). In fact, two of these tyres may be fitted side by side on a Socket Coupling to form a realistic double wheel which is particularly useful for models of buses and other heavy vehicles. The effect of this arrangement may be seen in Fig. 6 which shows a dragster fitted with these built-up wheels at the rear. The same picture shows a "recessed hub" formed by a Chimney Adaptor (Part No. 164) attached to an Axle Rod by means of a Rod Socket (Part No. 179) and fitted with an 080 tyre.

The front wheels of the dragster are formed by a ½ in. Pulley with boss (Part No. 22a) alongside a ½ in. "loose" Pulley (Part No. 23b) over which a No. 021 tyre has been fitted. The adjoining rims of the Pulleys fit nicely into the cavity inside the 021 tyre which is 13/16 in. in overall diameter. As can be seen in the illustration, this tyre has no tread, being intended for the *rear* wheels of the Dinky Toy dragsters.

Our last Dinky tyre is No. 030, shown in Fig. 9. As can be seen, this is actually a miniature caterpillar track, used in this picture on a tank made of only eight parts (including the two Grub Screws which hold the model together!).

The foregoing is by no means the limit to the uses of Dinky Toy tyres in the Meccano system. Meccano engineers will no doubt find other applications for the tyres mentioned, as well as uses for those tyres not mentioned. I have outlined only the obvious applications, and have not touched at all on their uses in clutch mechanisms or miscellaneous

uses such as fenders for small boat models, etc. Although not strictly Meccano parts, they are members of the same family, and those modellers to whom this fact is sufficient to validate their inclusion in Meccano models should derive a great deal of fun from their use. Meccano engineers who experience difficulty in obtaining these tyres should contact M.W. Models of Henley (see advertisement pages) who stock the full range.

Traction Engine Tyres

Moving away from Dinky Toy tyres, we turn to large models of traction engines. Meccano engineers have found many ways of providing tyres for the large wheels of this type of vehicle, usually resorting to non-Meccano items such as strips of rubber. It is however possible to provide a wheel of this type with a "tyre" made of Meccano parts.

The wheels of traction engine models are usually based on the Flanged Ring (Part No. 167b) or the Hub Disc (Part No. 118), and in each case tyres may be constructed as shown in Fig. 10 using the Caterpillar Track (Part No. P91) with a pair of Rings or Discs. It can be seen that the chain link mouldings of the track make a good tight fit in the recess between both the two Flanged Rings and the two Hub Discs. Eighty Track Links are required for the larger wheel illustrated and 42 for the smaller.

It will also be found that the caterpillar track can be fitted with the chain link moulding on the outside of the wheels, as shown in Fig. 11. This does not produce a tyre, but it does provide a drivable surface at the standard meshing distances for the Plastic Meccano Sprocket Wheels (Parts P83 & P84), thus making the assembly useful as part of a drivable built-up roller bearing for crane models, etc. The procedure is the same for the Flanged Rings for the Hub Discs illustrated. The number of Track Links required in this instance is 86 for the Flanged Rings and 47 for the Hub Discs.

The remainder of this article deals with building instructions for the models used as illustrations. At this point I would like to thank 14 year-old Nigel Robb of Henley-on-Thames for lending me his model of the "Dad's Army" wagon, the other models being my own.

Butcher's Wagon

Dealing first with construction of Nigel's Butcher's Wagon, the bonnet is formed by bolting a Double Bracket 1 (Fig. 1) to a Double Bent Strip 2 which is in turn bolted to a Flat Trunnion 3 secured between this bonnet unit and a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 4 forming the front wheel bearer. The front wheels (two $\frac{1}{2}$ in. Plastic Pulleys fitted with 093 tyres) are free to rotate on $\frac{1}{2}$ in. Bolts lock-nutted to the lugs of the Double Angle Strip. Another $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip, similarly equipped, forms the rear wheel assembly. Flat Trunnion is 3 overlaid by a Trunnion 5, as shown.

The body of the wagon is a "box" constructed by bolting four $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plates to two $1\frac{1}{2} \times 1\frac{1}{2}$ in. Flat Plates which form the ends. The offside Flanged Plate 10 (Fig. 2) is left loose on its Bolts.

At this point a Trunnion 6 is bolted, apex downwards, to the front plate of the box, then the front wheel assembly is secured to the underside of the box by a bolt 7, and the rear unit by another two Bolts.

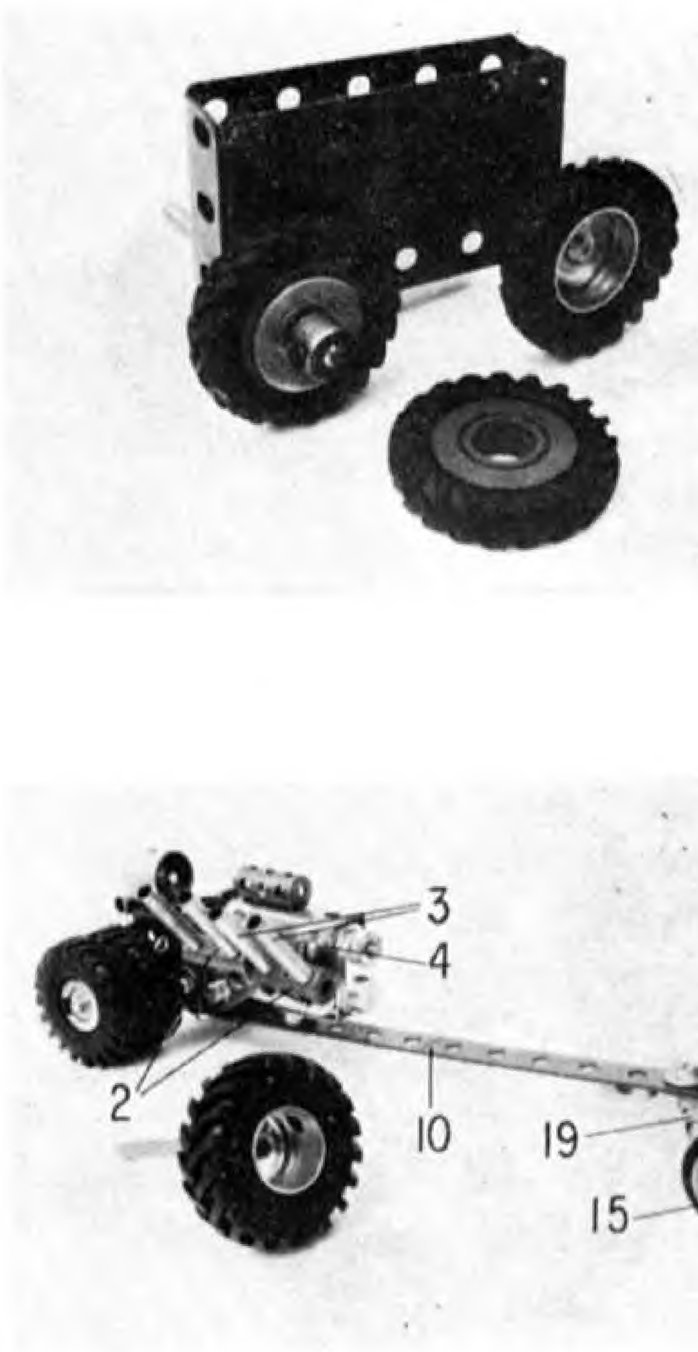
A pair of Threaded Bosses 8 are attached to Flanged Plate 10, as shown, the rear Threaded Boss being spaced from the Plate by a Washer 9, whilst a second Washer 11 is lodged between the front Threaded Boss and the flange of Plate 10. The upper Bolts holding Flanged Plate 10 are then tightened and the side secured in place by Bolts screwed into the Threaded Bosses. The Bolt entering from the front passes through the trapped Washer 11.

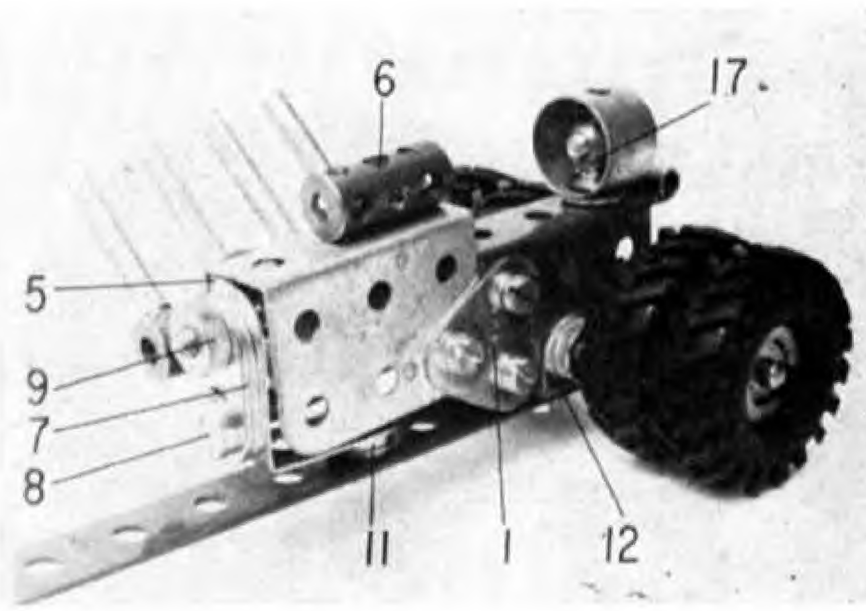
PARTS REQUIRED

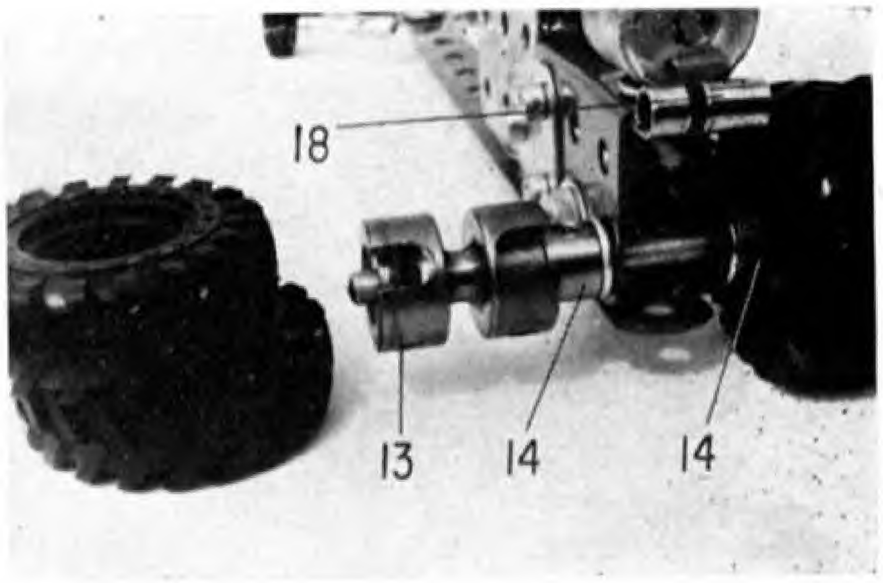
1—11	14—38	4—51	4—111a
24—37a	1—45	2—64	2—126
18—37b	2—48	2—74	1—126a
			4—Dinky Tyre 093

Tractor

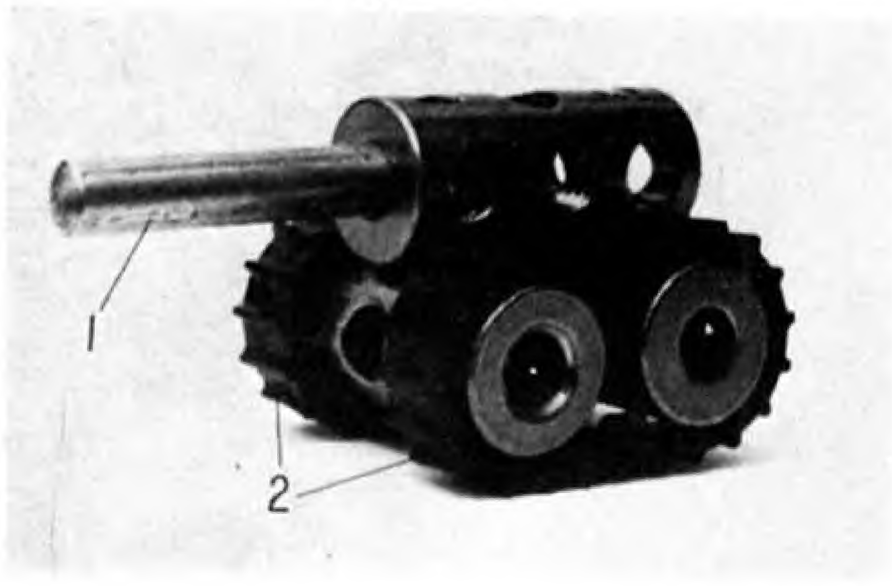
Turning next to the Tractor, an electrical Insulating Fishplate 1 (Fig. 3) is bolted to a 1×1 in. Angle Bracket 2, the upper Bolt also carrying a $\frac{1}{2} \times \frac{1}{2}$ in. Angle Bracket, forming a "U"-shape with Bracket 2. Pivotally attached to the lower arm of this "U" is a Coupling 3 (Fig. 4), the securing Bolt being passed through from the inside of the

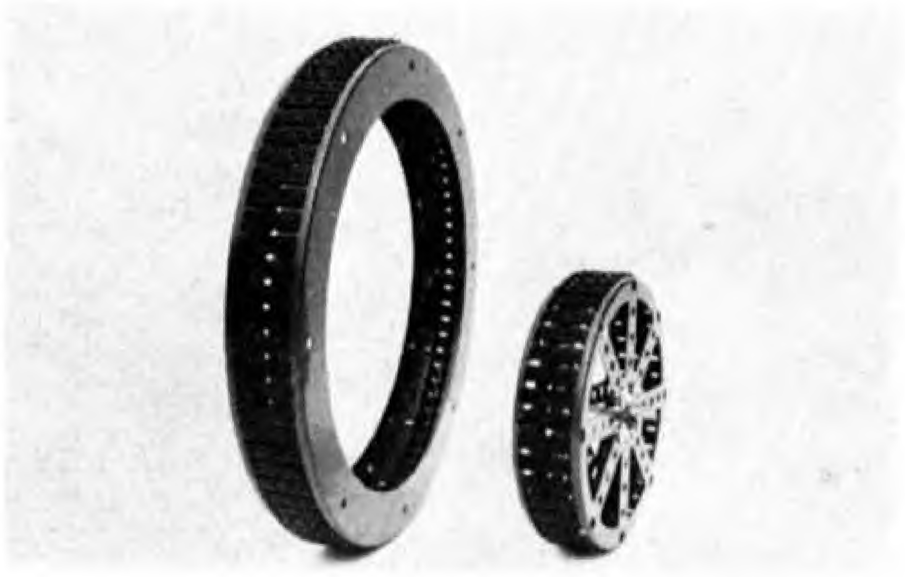


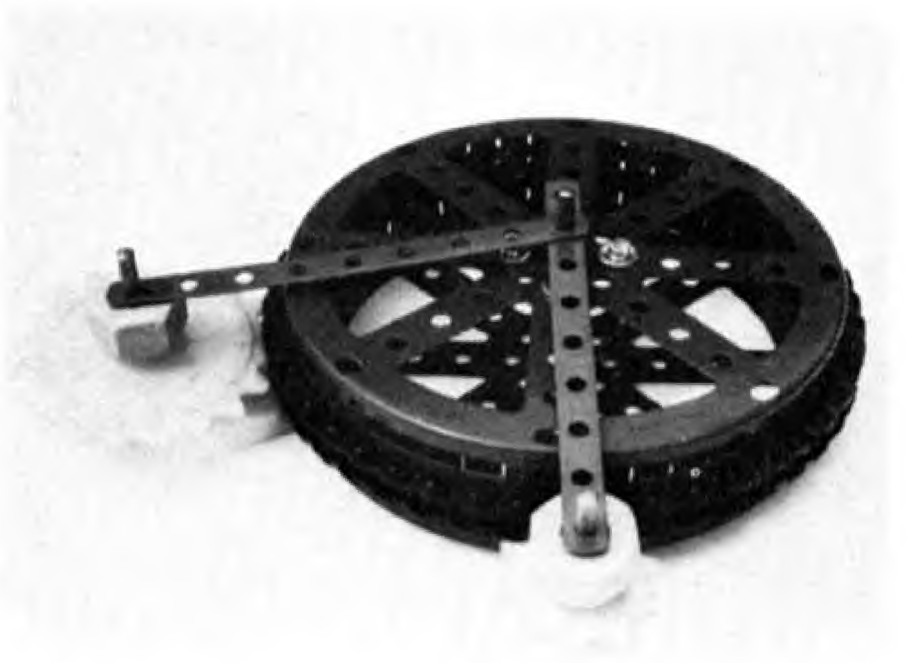


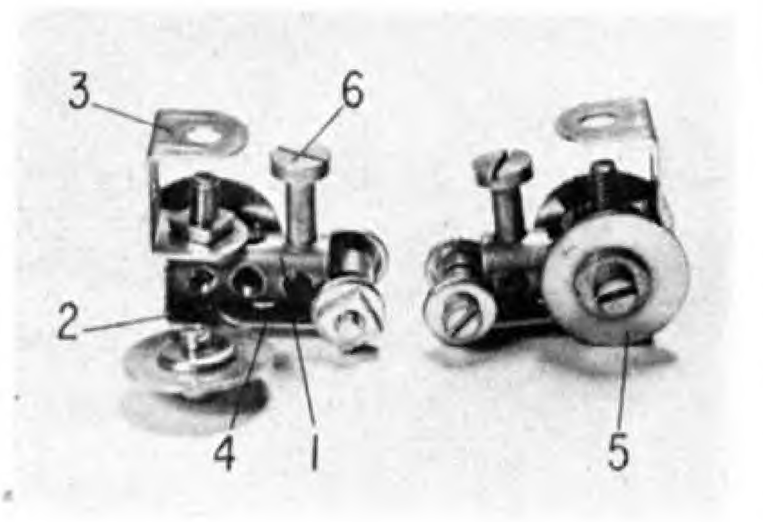


Top to bottom, Fig. 5, a demonstration unit showing two alternative methods of mounting Dinky Toy tyre No. 087. Fig. 6, a very realistic Dragster model which makes use of Dinky Toy tyres No. 080 at the rear and tyre No. 021 at the front. Fig. 7, a close-up view of the Dragster showing the engine and "driver". Fig. 8, one of the Dragster's rear wheels showing how a Socket Coupling will serve as the hub for a "double wheel" using two Dinky Toy tyres No. 080.









Top to bottom, Fig. 9, simplicity exemplified! A tiny little tank using two Dinky Toy tyres No. 030 as caterpillar tracks. Fig. 10, two large-scale traction engine wheels which make use of Caterpillar Track Links for tyres. Fig. 11, another use for the Caterpillar track to provide a positive drive to the outside of a built-up wheel. Fig. 12, slipped in by "Spanner"—a tiny Traction Engine designed by Stephen Kuc of the Stevenage Meccano Club.

"U"-bracket and engaged in the centre transverse tapped bore of the Coupling. Two "wheels" 4 are made by fitting Dinky 020 tyres over Collars and are then attached to the Coupling by two ½ in. Bolts passed one into each end where they are secured by the Couplings. Sufficient "play" should be allowed to enable the wheels to rotate.

The "engine" is represented by a Channel Bearing 5 carrying a Short Threaded Pin 6 in the centre top hole. The Channel Bearing is then fixed to the ½ × ½ in. Angle Bracket by a Contact Screw 7 which carries two Washers. A ¾ in. Bolt 8 carrying a Collar 9 is passed through the upper rear hole in the left-hand flange of the channel Bearing, is fitted with two Washers and another Collar and, finally, a Nut to hold the assembly in place. A pivot Bolt is screwed into the latter Collar to form the steering wheel, while a Pallet Pin 10 (Part No. 25, recently introduced in the Meccano Clock Kits) is inserted in Collar 9.

Next, a 2½ in. Strip 11 is bolted to the end hole in Angle Bracket 2, just behind the Coupling, and to the other end of this strip is fixed the rear wheel and seat assembly. This consists of two ¾ in. Bolts, each carrying from the outside, a ½ in. Plastic Pulley 12, a Plastic Meccano Pulley supported on a Collar and carrying a Dinky 087 tyre 13, a ¾ in. Washer, and two ordinary Washers. The bolts, which serve as the axles, are then each lock-nutted to a Double Bracket 14 which is fixed to the end of Strip 11 by means of another ¾ in. Bolt carrying an Obtuse Angle Bracket slipped into the slot of a Slide Piece 15 and two Washers. The Hook 16 illustrated is optional. (For the interest of Meccano historians, this Hook is actually a replica of Meccano's original Hook (Part No. 57) and copies are available from M.W. Models of Henley).

PARTS REQUIRED

1—6	11—37a	1—63	1—251
1—11	5—37b	4—69a	1—513
1—12	19—38	4—111	1—543
1—12a	2—38d	2—111a	2 Plastic
1—12c	1—50	1—115	Meccano
2—23	6—59	1—160	Pulleys P62
Dinky Tyres 2—020			
2—087			

Dragster

Coming now to the Dragster, the body is composed of two Channel Bearings joined together, but off-set one hole, by a 1 in. Triangular Plate 1 (Fig. 7) at each side. The exhaust units can be seen in Fig. 6 and four are required, two on each side of the body, although the near-side pair is not shown in the illustrations for reasons of clarity. Each unit simply consists of a Coupling 2, in the end transverse bores of which two 1 in. Rods are secured. Rod Connectors 3 are slipped over these Rods, then an Obtuse Angle Bracket 4 is secured to the opposite side of the Coupling by a Bolt passed through the round hole in the Bracket and into the centre transverse tapped bore of the Coupling.

When completed, the exhaust units are attached by the Obtuse Angle Brackets to the outer top holes of the front Channel Bearing, but note that the Bolt fixing the offside front unit in place also secures an Angle Bracket 5 inside the Channel Bearing. A Coupling 6 is secured to the top of the body assembly by passing two Bolts through from inside.

The front of the body unit is supplied by a 1 × 1 in. Angle Bracket overlaid by five Fishplates 7, secured by a Contact Stud 8 and a ⅜ in. Bolt fitted with a Terminal Nut 9, the latter Bolt and Nut also fixing the assembly to Angle Bracket 5 in the unit body. The lower lug of the 1 × 1 in. Angle Bracket is attached to the fifth hole in a 7½ in. Strip 10 by a ⅜ in. Bolt, spaced as necessary with Washers 11. The body unit is also fixed by means of a Double Bracket 12 bolted through the second hole in the Strip. The Double Bracket is secured to the body by means of a ¾ in. Bolt, the appearance of which is enhanced if a Terminal Nut is used instead of the normal Nut.

The rear wheels are each constructed, as described in the earlier part of this article, from two Dinky 080 tyres fitted on a Socket Coupling 13 (Fig. 8). The Socket Couplings are each supported on two Collars and the travel of the supporting 3 in. Axle Rod is limited by two further Collars 14, one each side of the body unit. The front wheels, also described earlier, consist of 021 tyres on ½ in. Pulleys with boss 15. They are mounted on a 3 in. Axle Rod, the travel of which is limited by two Collars as shown in Fig. 5. As can be seen, the Axle is attached to Strip 10 by a Right-angled Rod and Strip Connector 16, with the rod section (which will have to be eased

open to allow the axle to rotate) fitted to the underside of the Strip.

A "driver" is represented by a Handrail Support 17 containing a Bolt for his "face", held in place by a Grub Screw. The Handrail Support is slipped inside a Chimney Adaptor, representing the headguard, a Washer is added and the assembly is fixed into the rear hole of the body unit. A Right-angled Rod and Strip Connector 18 is added before the Nut, as shown.

The finishing touch is to bolt, two holes in underneath Strip 10, a Three-way Rod Connector 19 carrying 1 in. Axle Rods in its front two sockets. These Rods should be pushed in just far enough to allow the front wheels to rotate.

PARTS REQUIRED

1—1b	10—18b	5—63	2—160
5—10	2—23 or	8—59	1—164
1—11	23b	2—77	2—212a
1—12	2—23a	1—111	8—213
1—12a	16—37a	2—111c	1—213a
4—12c	20—37b	1—136	1—544
2—16b	16—38	2—171	2—542
2—Dinky Tyres 021			
4—Dinky Tyres 080			

Tank

My final model is the little Tank illustrated in Fig. 9 and, as can be seen, this is simplicity itself! Three Couplings are fixed together in the arrangement shown by two $\frac{7}{32}$ in. Grub Screws which engage their transverse tapped holes, one of the Grub Screws also holding a 1 in. Axle Rod 1 in place to form the gun barrel. The tracks—supplied by two Dinky 030 tyres 2—are then slipped over the two transverse Couplings—and it's finished!

'SPANNER' writes: In addition to Mike Nicholls' excellent models, I would like to slip in here one final and equally delightful simplicity offering designed by 10 year-old Stephen Kuc of the Stevenage Meccano Club. It's a marvellous little Traction Engine, built up from a Coupling 1 (Fig. 12) to the underside of which an Angle Bracket 2 is fixed by a $\frac{3}{4}$ in. Bolt, passed up through the end transverse smooth bore of the Coupling. The securing Nut also fixes a Double Bracket 3 to the top of the Coupling. Note that a Right-angled Rod and Strip Connector 4 is tightly sandwiched between the lower lug of Angle Bracket 2 and the Coupling.

Each rear wheel is represented by a $\frac{3}{4}$ in. Washer 5, sandwiched between two ordinary Washers on a Bolt screwed into the end transverse threaded bore of the Coupling. The front wheels are ordinary Washers on a $\frac{3}{4}$ in. Bolt carried in the rod portion of Rod and Strip Connector 4 and, finally, the chimney is a Pivot Bolt 6 locked by Grub Screws in the vertical front smooth bore of the Coupling.

PARTS REQUIRED

1—18b	3—63	2—69b
2—Dinky Tyres 030		

Statement by the Managing Director of Meccano (1971) Ltd.

As is announced elsewhere in these pages, this is the last issue of Meccano Magazine to be published by M.A.P. and, at the same time, is the start of a new and exciting magazine era for my company.

For the past five years, M.A.P. have published the Meccano Magazine on behalf of Meccano Ltd. and, in my opinion, they have made a fine job of it. I believe, also, that this is the opinion of the majority of serious Meccano enthusiasts, many of whom have written to "Spanner" with the genuine compliment thay the M.M. was at last returning to the high standard of the Meccano hobby magazine "it used to be". I echo this sentiment and I think all will agree it has been a good and highly interesting publication, particularly during the last two or three years under M.A.P. control.

M.A.P., however, is a self-contained publishing organisation, whose continued existence relies on profitable operation and, perhaps because of the high overheads of such an organisation, Meccano Magazine has proved unprofitable for them. They have now been forced to take the course which I can understand as being unavoidable in their circumstances.

The M.A.P. decision to discontinue publication is, of course, the result of their own experience solely with the magazine and is in no way connected with the international buoyancy of the Meccano product, or our own interest in this product. I naturally regret the need for the decision, but, in a sense (and with no disrespect meant to M.A.P.), it has proved a blessing in disguise by enabling us to bring the magazine "Home" again. As described in the official announcement on page 581, we will henceforth be publishing a new version of the magazine—the Meccano Magazine Quarterly—at our Liverpool headquarters which has been the "Home of Meccano" for more than 50 years.

It was from our Binns Road factory that the first issue of Meccano Magazine was published in 1916 and all subsequent issues since then, until that fateful year of 1964 when our own situation forced us to transfer the M.M. to an independent publisher outside the Company. Although this action was necessary at that time, my colleagues and I were personally sorry to lose direct responsibility for "our" magazine and we are therefore delighted to welcome it back under our own roof. Perhaps more important, though, I am convinced that the majority of Meccano enthusiasts will welcome the move. Our contact with readers indicates that, while supporting the M.M. over the past nine externally-published years, they have felt an inevitable weakening in the unique relationship which has always existed between Meccano Magazine readers and Meccano Limited. Now, we will again be in direct contact—I hope to our mutual help and interest—and I am delighted this is so. The Meccano hobby, I believe, cannot fail to benefit from such contact.

It is important to remember, however, that our new magazine will be published on a non-profit making basis and will therefore rely strongly on reader support for its continued existence. I am confident that the support will be wholeheartedly given, and I look forward to a long and successful life for the Meccano Magazine Quarterly.



PIERS of the REALM

By Peter M. Smith

AROUND BRITAIN'S 4,600 mile coastline, there are around 300 piers, which will have collected somewhere around a million pounds from holiday-makers this year. The popularity of these piers dates back to Victorian times, when the idea of walking over the water was a new and exciting wonder.

The first pleasure pier is believed to have been that at Ryde in the Isle of Wight, built in 1812. At first, it boasted a horse drawn tramway, but this was replaced some eighty years later when the first miniature electric railway was erected in its place.

Shortly after Ryde was opened, Capt. Samuel Brown constructed the famous Chain Pier at Brighton, described at the time as "a marvel of engineering". Of this pier, the poet Thackeray wrote, "Here, for the sake of twopence, you can go out to sea and face this vast deep without need of a steward with a basin. You can watch the sun setting with splendour over Worthing, or illuminating with its rising glories the ups and downs of Rottingdean. . . . See the worn out London roué pacing the pier, inhaling the sea air and casting furtive glances under the bonnets of the pretty girls who trot here before lessons."

A number of small shops, a camera obscura and a "high class reading room" were incorporated into the structure, but the original intention was to use the pier as a jetty for a fleet of steam packets to run across the Channel to Dieppe. Unfortunately, the rough seas often made ships seek the safety of Shoreham and Newhaven, and the arrival of the railway from London in 1847 settled this matter in favour of Newhaven.

When the pier first opened, many prophesied its immediate failure despite the builders' assertions that it would last a thousand years. It lasted, in fact, until 1896 when the authorities found it to be 6 ft. 9 ins. out of perpendicular, and decided to offer it for sale. Before any offers were received, a fierce gale reduced it to a tangled heap of scrap.

Another Brighton pier, the Palace Pier, has a strange story to tell. Opened in 1899, it contained a number of bathing machines bought by a Liverpool newspaper vendor out of the profits from his newstand. The money he made from his bathing machines enabled him to buy several of the newly invented penny-in-the-slot machines. He made so much from these attractions that he eventually became owner of the pier, and when he died, Oliver Dalton left a fortune of £129,000.

Just along the coast, at Bognor Regis, the local newspaper stated in 1863, "Piers are now the popular thing, they have the advantages of small risks, and pretty certain profits." Within two years a pier had been built, but the expected profits were not forthcoming, and in the end, the Town Council sold the pier for ten shillings to a company, on condition that they spent £10,000 making it safe.

Several resorts have more than one pier. Blackpool has three, the oldest being the North Pier, which dates from 1863. The opening, with the Town Crier proclaiming a public holiday, and cannons firing a salute, was actually recorded in the "Illustrated London News". An Indian Pavilion, bandstand, and handsome entrance were the main features of this pier, though on two occasions the pavilion was burnt down. Like most piers, it has suffered damage during gales; in 1892 a Norwegian ship was wrecked against the entrance, and later Lord Nelson's one-time flagship, the "Foudroyant" was wrecked, and storm waves smashed wreckage into the pier. Today, Blackpool's three piers are all run by the same company, providing entertainments and amusements for all tastes.

The old jetty pier at Great Yarmouth also has a link with Lord Nelson, for after two of his famous battles, at the Nile and Copenhagen, he landed here. The Dutch first constructed the landing stage in the sixteenth and seventeenth centuries, but after the great storms of 1953 it became so unsafe that a new one had to be built. To ensure complete safety, a model of the new pier was built at the Hydraulic Research Station at Teddington, and when completed the total cost came to over £300,000, but this will soon be recovered in harbour dues.

The Britannia Pier, at the same resort, has been privately owned since it was built in 1858, and the Wellington Pier, opened five years earlier, was built by a "local gentleman" at a cost of £7,000, and is "a memorial to his Grace, the Duke of Wellington."

Weston-super-Mare's Birnbeck Pier is quite unusual, because the pierhead is the offshore island of Birnbeck. This was another town which envisaged having a landing stage for sea-going vessels, but these plans had to be scrapped because of dangerous cross currents and the silting of the sea. Nevertheless, pleasure steamers do carry holidaymakers on local services to such places as Clovelly, Barry, Ilfracombe and the beautiful Avon Gorge.

Worthing did, in fact, have steamers plying from its pier head to Brighton daily, later to the Isle of Wight and even across the Channel to Boulogne. This pier has certainly lived a life of violence since it was opened in 1862, for not only has it been burnt and

blown down, but also blown up. At Easter 1913, terrible storms swept away the promenade deck, leaving the landing stage and pavilion stranded nine hundred feet from the shore. When the repairs were completed in the following year, the grand re-opening ceremony was performed by the Lord Mayor of London.

Although the pier at Skegness is one of the few still remaining in private hands, it was originally built for the Earl of Scarborough and opened nearly 90 years ago by the son of Queen Victoria. It is Britain's fourth longest pier, and a popular excursion in the old days was by boat across The Wash to Hunstanton. At one time, a famous figure here was Daredevil Peggy, a one legged man who used to dive off the end of the pier. When he died, his son Daredevil Leslie kept up the tradition by thrilling the crowds with his daring dives.

Not only the longest in Britain, but the longest in the world, Southend's pier stretches one and a third miles out to sea. The first part of this structure was opened in 1830, and was lengthened sixteen years later. Horse drawn trams carried visitors along its length but, as the railways became more popular and hundreds more visitors, especially from London, flocked to the resort, a great new iron pier was built. At the same time, an electric train was added at a cost of £80,000. During the last war the pier was vitally important, serving as a rendezvous for 85,000 ships. A popular pastime today is for schoolchildren to attempt new walking records by marching up and down the pier on a specially marked course.

Almost every pier can claim some record. Southport's, only a few hundred yards shorter than Southend's, was the world's first pier to be built entirely of iron. Here too, a train, the "Southern Belle", carries visitors along the pier's full length. Clacton can boast the largest ballroom over the sea. This pier, together with a fleet of steamers, was bought very cheaply by a holiday camp owner about fifty years ago, and its present value is said to be in excess of £800,000. At Skegness, nearly two thousand panes of glass give that the prize for the largest single glass covered canopy, though during a gale it did cause quite a problem.

Most piers are normally repainted every two years, and this can cost up to £3,000. A similar amount of money is needed to cover the cost of scraping barnacles off the understructure, and for this job several piers employ resident divers. His job also includes rescuing such items as handbags and other valuables dropped accidentally over the sides of piers.

The strangest story connected with a pier must surely be that concerning an old wooden pier at Harwich. This was bought very cheaply by a London scrap dealer, who then had all the wood chopped up and made into over two and a quarter million bundles of firewood. When all the bundles were sold, he finished with a considerable profit from his "scrap."



Opposite page, Skegness Pier & Central Beach from the West. Note part of the mile-long seafront "waterway ride" in the foreground. Right, Southend's 2 km. long pier is the longest pleasure pier in the world. Second longest is on the other side of the Thames estuary, at Herne Bay, the pavilion of which was recently totally destroyed by fire.

Lords of the Sea by E. Harper

OVER the centuries the Vikings have achieved a certain glamour which tends to hide their real image. Living in an age when the oceans were virtually unknown territory, this race of sea-rovers became notorious for their courage and skill but they were cruel as well.

From the eighth to the 15th century they populated the coasts of Scandinavia, living by and on the sea. From childhood, boys were trained in seamanship and quickly acquired a knowledge and respect for the sea that served them in good stead all their life. Piracy, as we call it, was regarded by the Viking race as a way of life which supplied them with wealth and adventure and gave a youth a chance to prove himself.

At 18, the Viking young men were put to the test. Each lad was given a boat with all necessary equipment. In this he had to go to sea and not return until he had a battle or two behind him, plunder to bring back, or had discovered fresh lands for his fellows to visit. To do this meant longer and longer voyaging as generations succeeded generations. Iceland, Greenland, the coast of N. America were all within their reach. Viking settlements have been found in all these countries and the Shetland, Orkney and Faroe islands were Viking colonies. The 'Northmen' while in Britain gave us our love of the sea.

Nearer home, the British Isles and European coasts were within easy grasp. Fear of the 'long ships' was very great in coastal hamlets, yet despite undoubted ruthlessness, Vikings had a code of honour. Sometimes, the enemy ships would be fewer than on the Vikings' side and in this case, a fair fight was ensured by withdrawing some of their own boats until both sides were equal in numbers. But no mercy was shown to the vanquished. Those not slaughtered were carried home as slaves after a sea-fight, while marauding parties ashore burned the homes of those they killed or took captive.

Another way of settling with the enemy was for the opposing captains to fight it out in private battle. Usually the loser was killed but if he had impressed his Viking opponent by skill and valour, he was allowed to live and take part in a blood ceremony. Each fighter daubed his weapon with his own blood and undertook to avenge the death of the other.

Fighting became an art with these warlike men. One device often employed in battle was to secure several long-boats side by side and guard them with shields placed around the gunwales. Harald Hardraga was a notoriously wily captain. Once when attacking a hamlet in Sicily, he ordered the capture of birds which nested in the thatched houses. Then he tied small

torches to their legs and set these alight. Flying in panic, the birds set fire to the houses and in the confusion the Vikings attacked and demolished the village.

Naturally fear exaggerated tales of their exploits. In time legends grew up around these dreaded fighters. One told how the 'Skibladnir', a well known long-boat, had been built by dwarfs and was so large all their weapons and equipment could be carried in her. In actual fact, the biggest ships with 100 oars were mainly used to terrify the enemy while smaller 12 oared boats were used for fighting. Each captain, or local King, commanded his own fleet of armoured vessels, sometimes as many as 700. Armoury ranged from cables used to capsize the enemy's boats to bows and arrows and stone-slings.

The Vikings knew the power of psychological warfare. To see a fleet of black boats approaching was enough to scare anyone but when these boats had terrifying figures fore and aft, demoralisation increased. Usually a serpent's head or dragon-like beast was carved, head at the bow, tail astern. When later in their era most Vikings exchanged paganism for Christianity, they kept their fearsome carved figureheads as examples of evil. Conversion was not always from the heart. Olaf Tryggrason was only too pleased to 'convert' his fellows by battle. If they refused to turn Christian, he had a fool-proof excuse for a fight, keeping any boats and plunder to swell the Church funds through his own possessions.

For a Viking to become a Christian meant a great change. Vikings believed that to be killed in battle ensured a place with the Gods in Valhalla where fighting lasted all day, and the wounded were treated by night to fight again on the morrow. To die in bed meant damnation in the land of Hela, the Norse equivalent for Hell. No wonder Olaf found physical persuasion necessary to increase his converts.

Fortunately they had a burial custom which enables us to gain a true picture of what these Viking boats were like. When a chief died, his boat was buried with him. In the Viking ship hall at Oslo, the Oseberg Ship, the Gokstad Ship and the Tune Ship, all carefully restored, can be seen. The names refer to the site of burial. Denmark has two Viking ships and the Isle of Man also has a couple.

As shipbuilders they were superb. Planks were thinned to the precise degree required. Animal hair twisted and rubbed together formed the caulking. Pine floorboards made the deck. With a striped red and yellow sail and demoniac figureheads, no wonder they terrified all whom they met.

The Oseberg ship, dug out of the mud in 1904, had a 19.8 metres long keel made of oak, and boasted 30 oarsmen who buried their oars with their chief. Naturally the figurehead at the bow, a serpent's head, was well carved with gaily painted fierce eyes. It is interesting to find that the mast, 13 metres high, was of pinewood, the anchor of iron, while the rudder, really an outsized oar, could be steered by a tiller. Probably the Oseberg ship never crossed the ocean but was used in coastal work.

Whether you dislike their warlike habits or admire their courage, there is no doubt that this race of fighting seamen had a remarkable record of discovery, trade and settlement to their credit. There was no room for the weakling in their way of life and without their enterprise, much nautical knowledge would have been lost to succeeding navigators and shipbuilders. We owe them a debt, for in the Dark Ages, tribes united into nations to repel them and eventually, on settling in our land, they brought their trades and skills with them to our lasting benefit.

---

wheel. To achieve this a pair of 3 × 1½ in. Double Angle Strips 130 are bolted together with the lugs overlapping, the fixing Bolts also securing two Bush Wheels 131 in place, one each end with bosses outwards. A 5 in. Rod is mounted in the bosses of the Bush Wheels and this should be positioned before the Bolts are tightened to ensure that the Bush Wheels are exactly in line so that the Rod runs perfectly freely. This Rod carries a 1½ in. Pulley with Tyre 132 at one end and a Universal Coupling at the opposite end, allowing the Rod an essential half-inch end float.

Two 1 in. Corner Brackets 133 are bolted to the centre of Double Angle Strips 130 to complete the friction wheel carrier which is pivotally attached to the machine by a 3½ in. Rod passed through the Corner Brackets and located in an upper hole of the rear panel. The outer end of this Rod is supported by a further 1 in. Corner Bracket 134 bolted to the rear of the body. Collars retain the Rod, Washers being employed to space the carrier away from the body.

To keep the friction wheel firmly in contact with the flywheel, the carrier is spring-loaded by a Tension Spring 135 retained on the inboard Bushwheel by a lock-nutted ½ in. Bolt. A 1 in. Bolt lock-nutted to the rear panel of the machine secures the lower end of the Spring. The Universal joint on the end of the friction wheel Rod is connected by a 1 in. Rod to a further Universal Coupling 136 which also carries a 2½ in. Rod, this latter Rod being journalled in a pair of Flanged Brackets bolted to the rear panel of the machine base. A 1½ in. Sprocket 137 is locked on this Rod.

Bolted to each flange of an E15R Motor are four downward-projecting Angle Brackets, these being fixed to a pair of 3½ in. Angle Girders 138 which are in turn bolted to the rear of the machine. The output shaft carries a ¾ in. Pinion which drives a 50-teeth Gear Wheel on a 2½ in. Rod journalled in the Motor side plates. On the opposite end of this Rod is mounted a ½ in. Pinion, meshing with a 57-teeth Gear Wheel 139 immediately above it. This latter Gear is fixed on a 3½ in. Rod located by a Collar, a 1 in. Sprocket Wheel 140 also being mounted on the right-hand end of the Rod. This Sprocket is connected by Chain to Sprocket Wheel 137 on the driving shaft.

This completes the assembly and it remains only to "time" the two cams, two Eccentrics and the crank to give the sequence of operation detailed at the beginning of these articles. It is essential of course, to ensure that each mechanism turns freely and is lubricated to give a good and reliable operation of the finished model—which, it is guaranteed, will even rattle in a similar manner to its full-size counterpart!

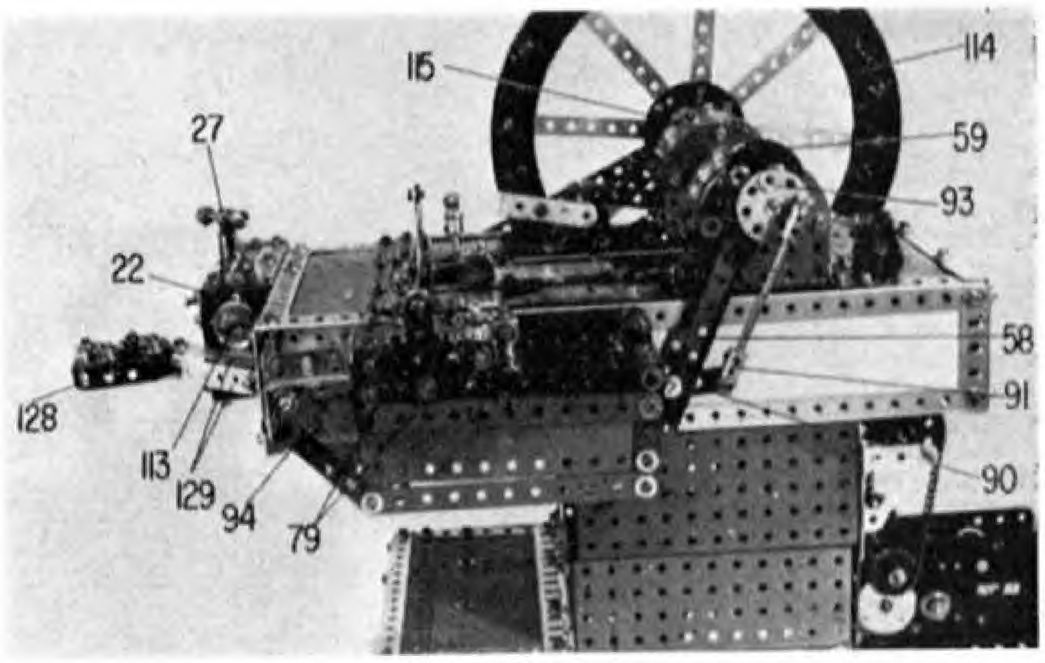
PARTS REQUIRED

5—1b	1—15	9—62	1—136
15—2a	1—15b	8—63	1—139
6—3	4—16a	1—63c	1—139a
7—4	3—17	6—70	2—140
9—5	3—18a	2—72	1 | 142
8—6	5—18b	2—73	1—147a
9—6a	1—21	2—74	5—147b
8—8	2—22	4—77	1—147c
4—8a	7—23b	1—94	1—148
13—8b	5—24	1—95a	1—160
6—9	1—25	1—96	3—161
4—9a	1—26	1—102	2—166
3—9c	1—27	1—103f	2—167b
12—9d	1—27a	4—103h	1—179
6—9e	2—31	2—103k	8—188
7—10	6—35	1—108	5—189
1—11	310—37	2—114	12—190
1—11a	2—43	6—115	14—193
13—12	1—44	1—116a	3—196
2—12a	2—45	2—126	1—197
3—12b	2—47a	4—126a	4—212
10—12c	3—48	1—128	4—214
2—13	1—50	1—130	1—222
2—13a	4—53	1—130a	1—235
1—14	2—53a	2—133	1—235b
1—14a	19—59	5—133a	1—E15R Motor

1 Paxolin or metal disc 1¾ in. diameter

Automatic Rivet-Making Machine

Last of a four-part series by Paul Blythe



Flywheel

We now come to the flywheel which is built up from a pair of 9⅞ in. Flanged Rings 114, sandwiched between which are eight spokes formed by 4½ in. Strips. The inner ends of the Strips are neatly arranged and bolted to the outer circle of holes in a pair of Face Plates 115. Spacing Washers will be required to ensure neat assembly and note that the sixteen securing Bolts should not be tightened until the wheel is found to be running true. The wheel is mounted on the left-hand end of the crankshaft where it is held in place by the set screws in *both* Face Plates.

Base Assembly

Turning to the base of the machine, the two 5½ × 2½ in. Flanged Plates 53 at each side of the body are extended down by two further similar Plates 116, their long flanges being bolted together. This second pair of Plates are joined across the machine by a 7½ in. Strip 117 which overlays a 5½ × 2½ in. and a 2½ × 2½ in. Flexible Plate, these Plates being reinforced four holes down by a 7½ in. Angle Girder 118, slotted flange forwards.

Bolted through the lower row of holes in each Plate 116 is a 9½ in. Strip Plate 119 extending the assembly forwards by a further eight holes. These Plates at each side are overlaid by 9½ in. Strips with the front and rear edges being capped by vertical 2½ in. Angle Girders. The bottom edges are reinforced by 12½ in. Angle Girders 120 extending six holes rearwards. Further Flexible Plates and a 7½ in. Flat Girder 121 fill in the horizontal shelf which is edged at the front by a 7½ in. Angle Girder 122. The front panel of the shelf is also enclosed by Flexible Plates and strengthened at the bottom by a further 7½ in. Girder 123, slotted flange outwards.

Dealing now with the rear of the base, this is completely panelled with Flat Plates reinforced at the lower edge by a 7½ in. Angle Girder 124. Two 3½ × 2½ in. Flanged Plates 125 and a 3 × 1½ in. Flat Plate complete the rear horizontal panel which, again, is strengthened by a 7½ in. Angle Girder 126, slotted Flange outwards and fixed by three Angle Brackets. The base itself is edged by additional Girders, these being bolted with the flanges projecting downwards. The four corners are completed by diagonally-fixed 1½ in. Strips, the vertical flanges being enclosed by Obtuse Angle Brackets and Fishplates 127.

Above, a general view of the right-hand side of the finished Riveting Machine. Below right, the completed machine as it appears when viewed from above. Below left, a rear view of the completed model showing construction of the base and the motor drive system.

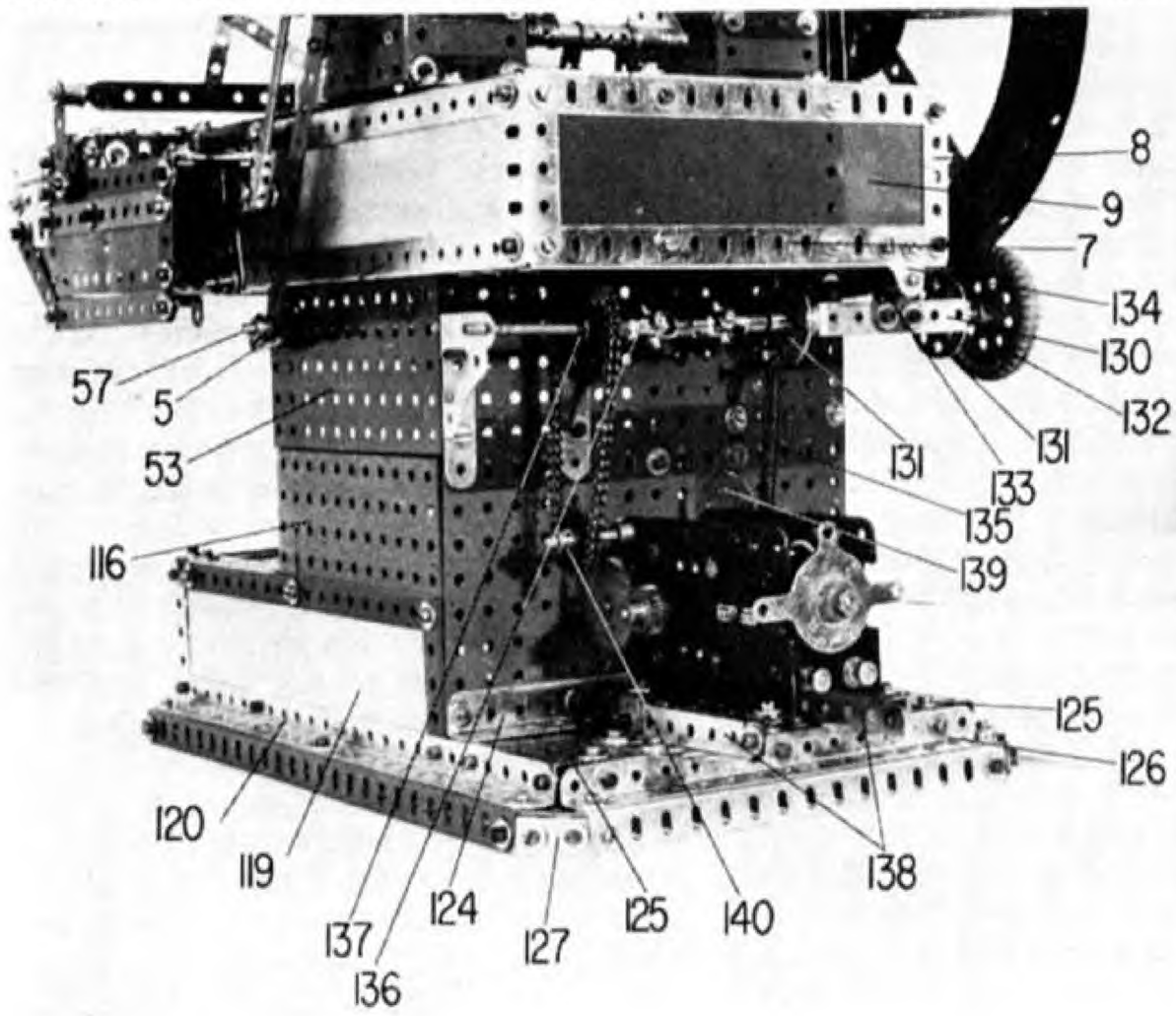
Wire Straightener

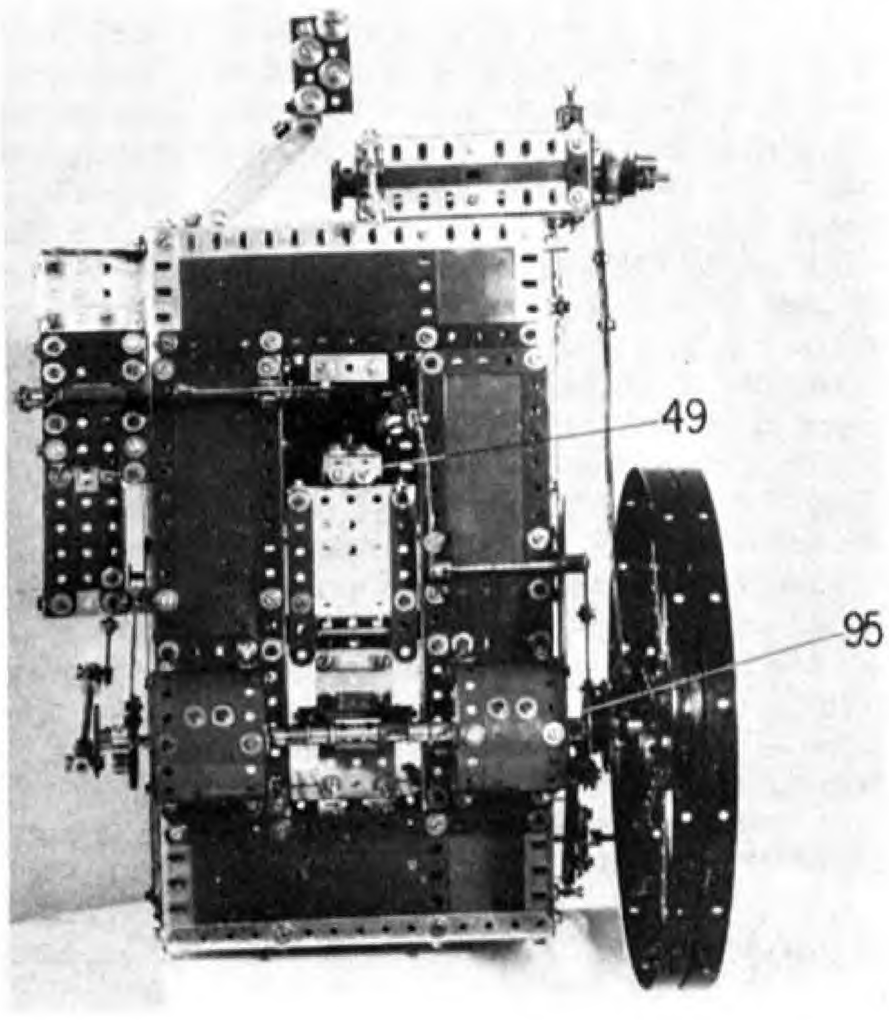
Moving upwards from the base to the wire-straightening mechanism, two Girder Brackets 128, with their wide flanges overlapped, are secured together by four ½ in. Bolts, a ½ in. Pulley being fitted under the head of each Bolt. The front end of the assembly is enclosed by two Angle Brackets, then the unit is attached to the front of the body by a pair of 3 in. Strips 129, connected by Fishplates and Obtuse and "ordinary" Angle Brackets.

Motor Drive Assembly

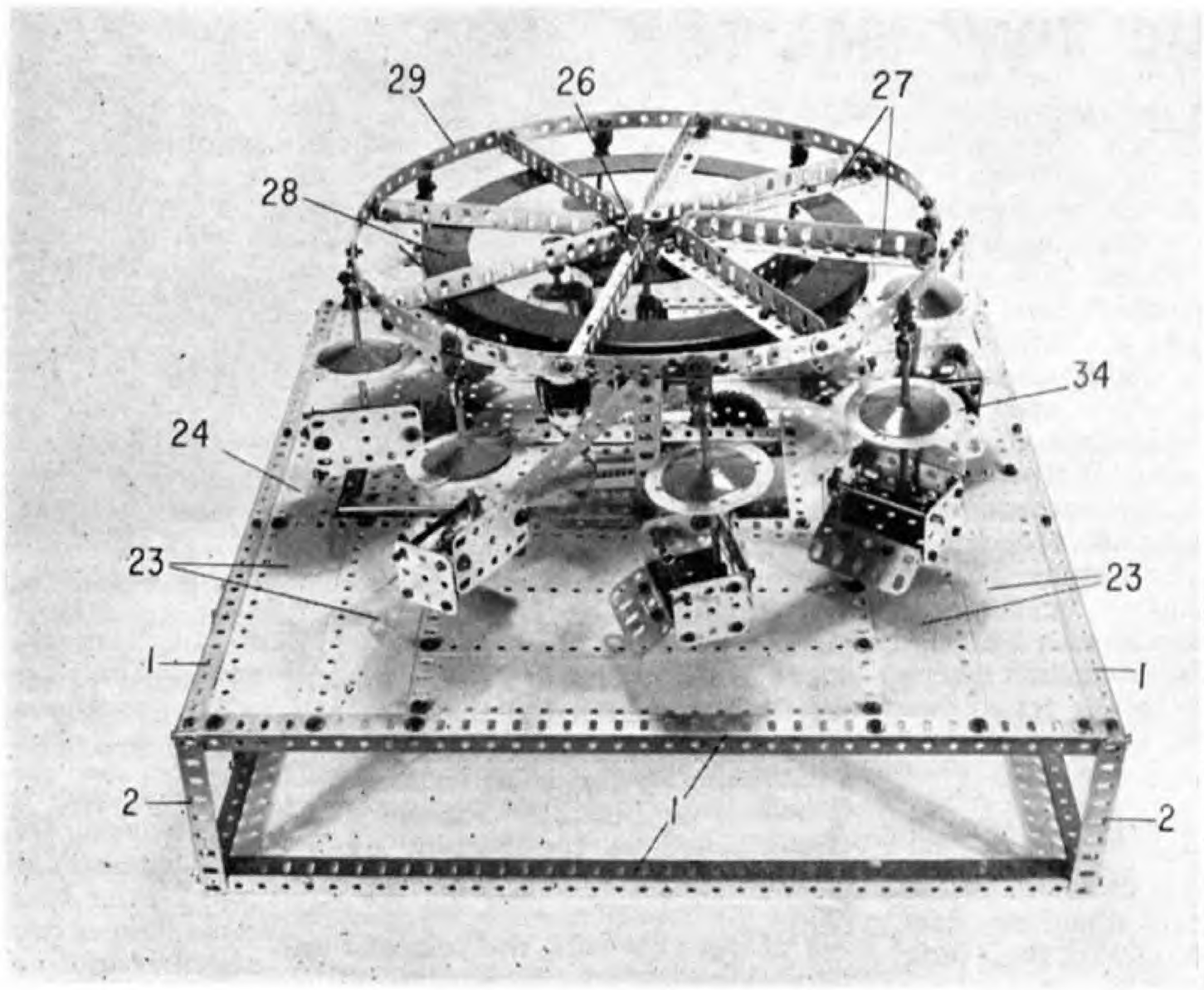
Finally, we have the drive system. Although the real machine is driven by rear-mounted motor and "vee" belt on the flywheel, it is more convenient to drive our model by a friction wheel bearing on the fly-

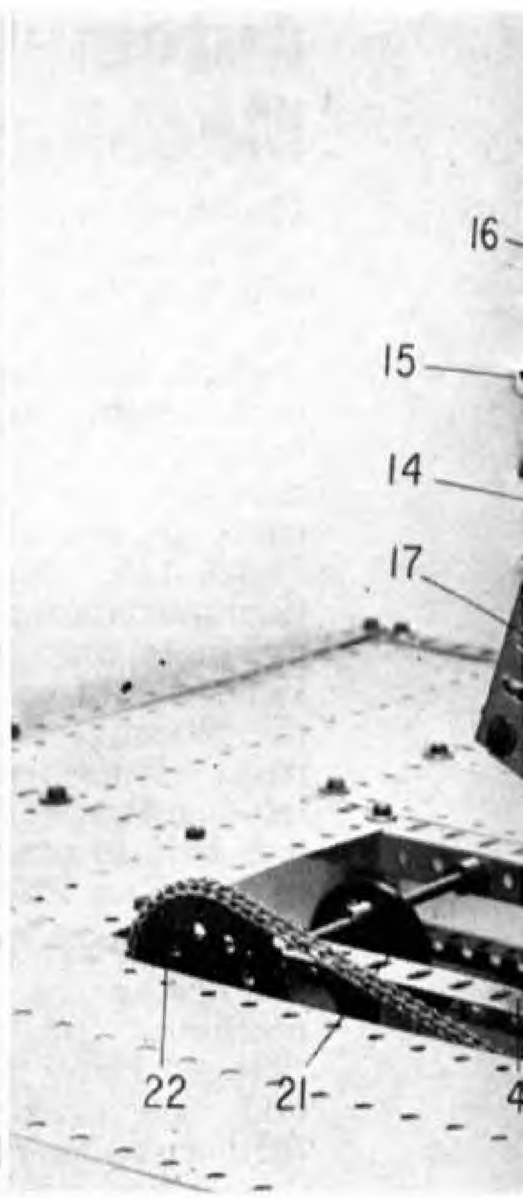
(*continued opposite*)





Far right, "Rising Swingers" is the title 'Spanner' has given to this intriguing Meccano fairground ride. Centre, in this illustration, the revolving structure has been removed to show the tilting arm.
Right, in this general view of the "Rising Swingers" the overall layout of the model is clearly shown.





RISING S

'Spanner' descri fairgro

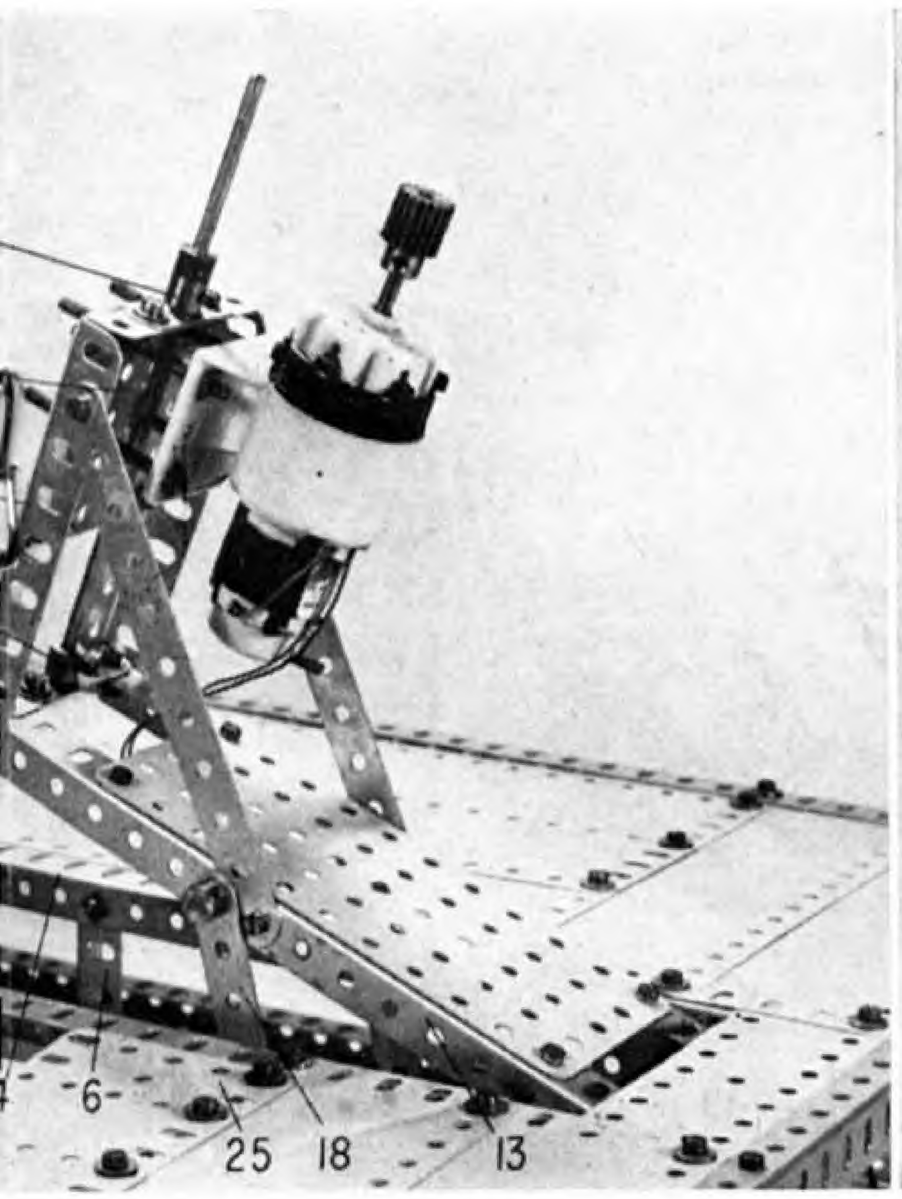
LOOKING back through past issues of Meccano Magazine, it struck me that we haven't paid a visit to the fairground for some considerable time—speaking purely from a model-building point of view, of course. Fairground rides have always proved popular with modellers, as well as with members of the public who see their models, so we felt it was about time that we again presented something in this line. I say "again" because we have featured very many fairground models in these pages over the years—so many, in fact, that I might have thought we had covered everything there is to cover, if our ingenious Yorkshire model-builder hadn't come up with the quite fascinating "Rising Swingers" illustrated in the accompanying photographs!

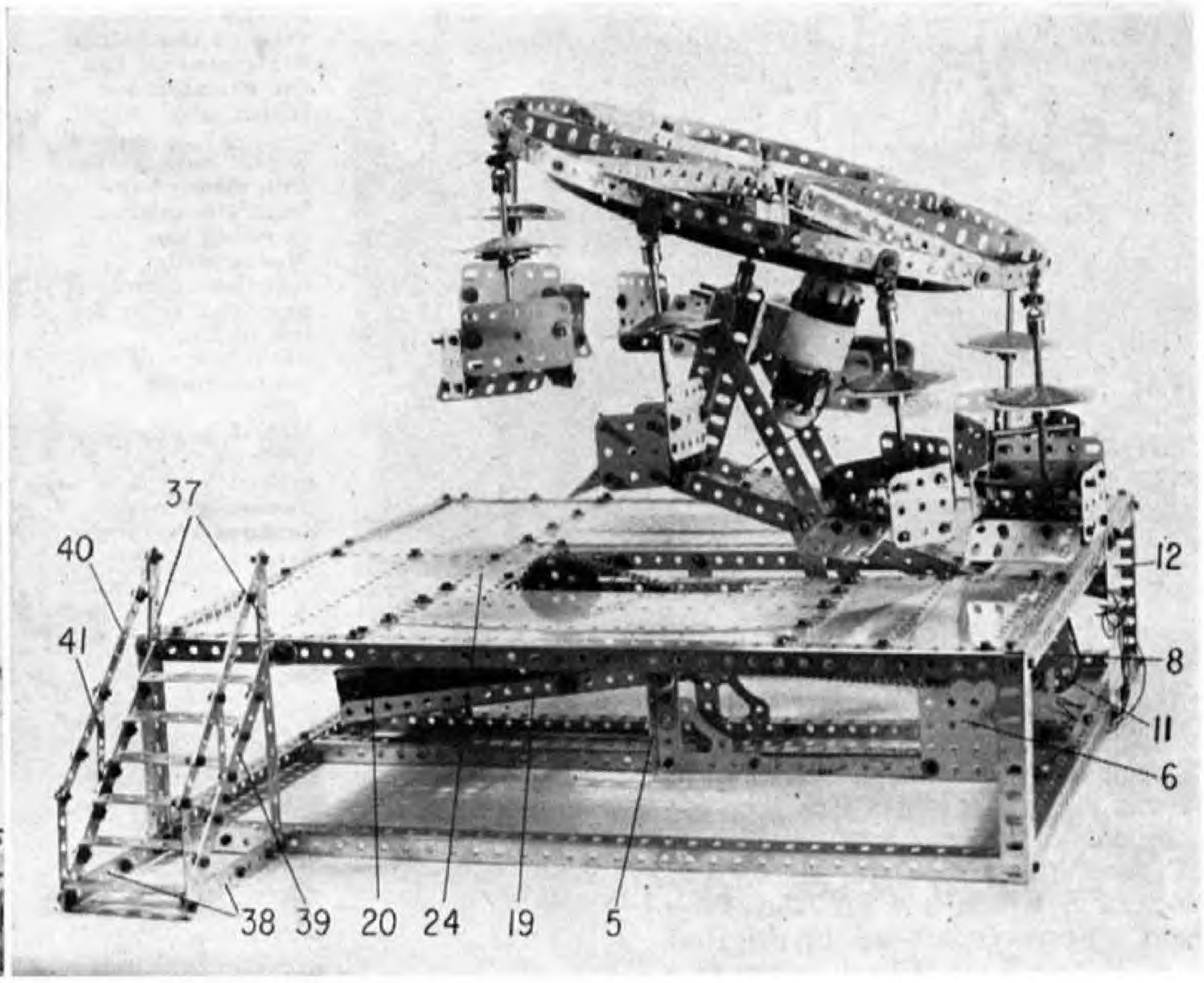
I hasten to add that "Rising Swingers" is the name I have given to the model. I seriously doubt if it is the correct title, but I do think it describes the model reasonably accurately. Basically, it is a roundabout in which the passenger chairs are suspended on a pivoted overhead mounting. Thus, as the roundabout revolves, the chairs swing outwards under the action of centrifugal force. This movement, alone, would not be particularly outstanding, of course, but it is not the only movement. While the chairs are whirling round, the whole revolving section gradually rises up at an angle until the chairs are spinning well out of the vertical, and then it sinks down again to normal, then up again, and so on as often as required.

The two distinct movements are achieved with the minimum of trouble in the model by the use of two separate Motors with Gearbox, one to drive the revolving motion and the other the lifting action, but we will deal with these as we come to them. Construction begins with a base framework consisting of two separate square Girder constructions each built up from four 18½ in. Angle Girders 1, the two squares being connected together at the corners by 4½ in. Angle Girders 2. Two further 18½ in. Angle Girders 3 are bolted between the sixteenth and twenty-second holes of two opposing lower Girders 1, while another two similar Girders 4 are bolted between the fifteenth and twenty-third holes of corresponding upper Girders 1. The centres of Girders 3 and 4 are connected by two 4½ in. Angle Girders, the lower connection in each case being strengthened with a Corner Gusset. A Crank 5 is bolted to each Gusset and Girder, the boss coinciding with the centre hole of the Girder.

Also bolted between Girders 3 and 4, in the positions shown, are two 4½ × 2½ in. Flat Plates 6, in which a 4½ in. Rod 7 is held by Collars. A $\frac{7}{16}$ in. Pinion on this Rod meshes with a 60-teeth Gear 8 fixed vertically above it on another 4½ in. Rod, also held by Collars in Plates 6. A ½ in. Pinion is also secured on the Rod, this meshing with a 2½ in. Gear 9 on a 5 in. Rod held by Collars in the Flat Plates. A ¾ in. Sprocket Wheel 10 is secured on the end of this Rod. A 1½ in. Pulley 11 is now fixed on the opposite end of Rod 7, this being connected by a 6 in. Driving Band to a ½ in. Pulley fixed on the output shaft of a Motor with Gearbox secured to a 4½ × 2½ in. Flat Plate 12, bolted between nearby Angle Girders 1 and 2. The Motor gearbox is set into the 16:1 ratio.

As can be seen from the photographs, the top of the base framework is enclosed by suitable plating, but, before adding this, it is advisable to complete the lifting arm and turntable drive system. Two 7½ in. Angle Girders 13 are joined at one end by a 2½ in. Strip and throughout the major part of their remaining length by a 4½ × 2½ in. Flat Plate. Two upright 4½ in. Angle Girders 14 are bolted to the inner ends of the Girders and braced by two 5½ in. Strips running between the centre holes of Girders 13 and the second





WINGERS

bes a fun-packed und ride

holes down of Girders 14. A 2½ in. Angle Girder is bolted between the upper ends of Girders 14, the securing Bolts helping to fix a 2½ × 2½ in. Flat Plate 15 to the "backs" of the Girders. A Double Arm Crank 16 is bolted to the upper flange of the 2½ in. Girder, another similar Crank 17 being bolted to the 2½ in. Strip joining Girder 13, then four 2 in. Screwed Rods are tightly fixed by Nuts in Flanged Plate 15 in the positions shown, the two upper Rods also passing through the 2½ in. Angle Girder. The second Motor with Gearbox, set in the 32:1 ratio, is securely fixed by Nuts on the Screwed Rods, the exact positioning of the Motor later being determined by the turntable drive gearing. A ½ × ½ in. Pinion is fixed on the end of the Motor output shaft.

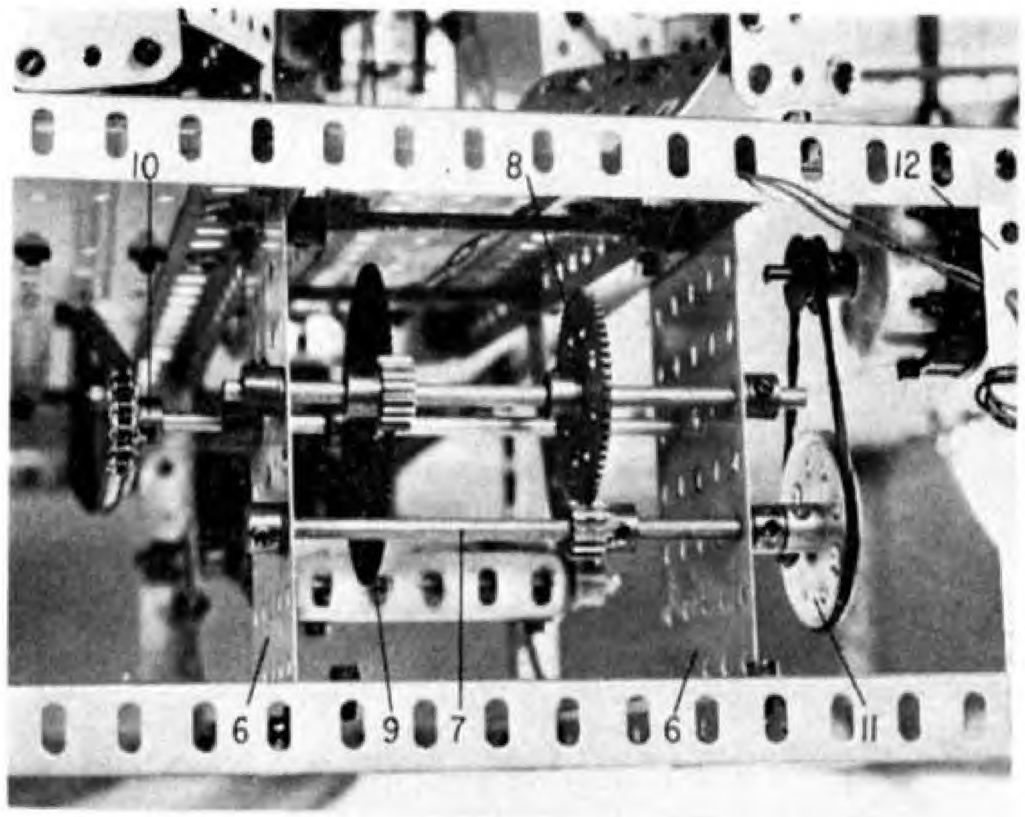
Four 3½ in. Strips 18 in two pairs, one on top of the other, are pivotally attached to Girders 13 by a 3 in. Rod which passes through the end holes of each pair of Strips and through the ninth holes inward of Girders 13. Collars hold the Rod in place. Pivotally attached to the lower end of the Strips by a 3½ in. Rod held by Collars are two 12½ in. Angle Girders 19, connected together at the ends and through their eighth and tenth holes by four 2½ in. Angle Girders, the Rod passing through the end holes of Girders 19. A suitable counterweight 20 (we used a 3½ lb. chunk of lead) is secured to the opposite end of the Girders.

Bolted to each Girder 19 is a Double Arm Crank, the boss of the Crank coinciding with the ninth hole of the Girder. The assembly, thus far built, is now mounted in the base framework by means of a 5 in. Rod passed through the bosses of these Double Arm Cranks and through the bosses of Cranks 5. Note that the Rod is fixed in the former Cranks, but is free to turn in the latter.

Now held by Collars in the twelfth holes from the counterweight end of Girders 19 is a 3½ in. Rod, on which a Crank is fixed. The arm of this Crank is, in turn, fixed to the arm of a Triple-throw Eccentric 21, secured by this ¾ in. stroke boss on a 5½ in. Rod held by a Collar and a 2 in. Sprocket Wheel 22 in the fifteenth holes of Angle Girders 4 in the base frame. Sprocket Wheel 22 is connected by Chain to Sprocket Wheel 10, then the top of the base frame is enclosed. We used ten 9½ × 2½ in. Strip Plates, four 7½ × 2½ in. Strip Plates 23, two 5½ × 1½ in. Flexible Plates 24 and one 2½ × 1½ in. Flexible Plate 25, all arranged as shown.

This brings us to the actual revolving section of the model which should present no difficulty. A "wheel" is built up from a 3½ in. Gear Wheel 26, to which eight radiating 5½ in. Angle Girders 27 are tightly fixed by ½ in. Bolts, each Girder being spaced fron the Gear by a Collar on the shank of the securing Bolt. A 9⅞ in. Flanged Ring 28 is bolted to the Girders through their fourth holes from the outer ends, then a wheel-rim 29 is provided by eight 5½ in. Strips, gently curved to shape and attached to the ends of the Girders by Angle Brackets. The completed wheel is secured by the boss of Gear 26 to a 6½ in. Rod mounted free in Double Arm Cranks 16 and 17. A Collar on the Rod above Crank 16 holds the Rod in place. Gear Wheel 26, of course, meshes with the ½ × ½ in. Pinion on the nearby Motor output shaft and the Motor should be adjusted on its Screwed Rod mountings to ensure perfect engagement.

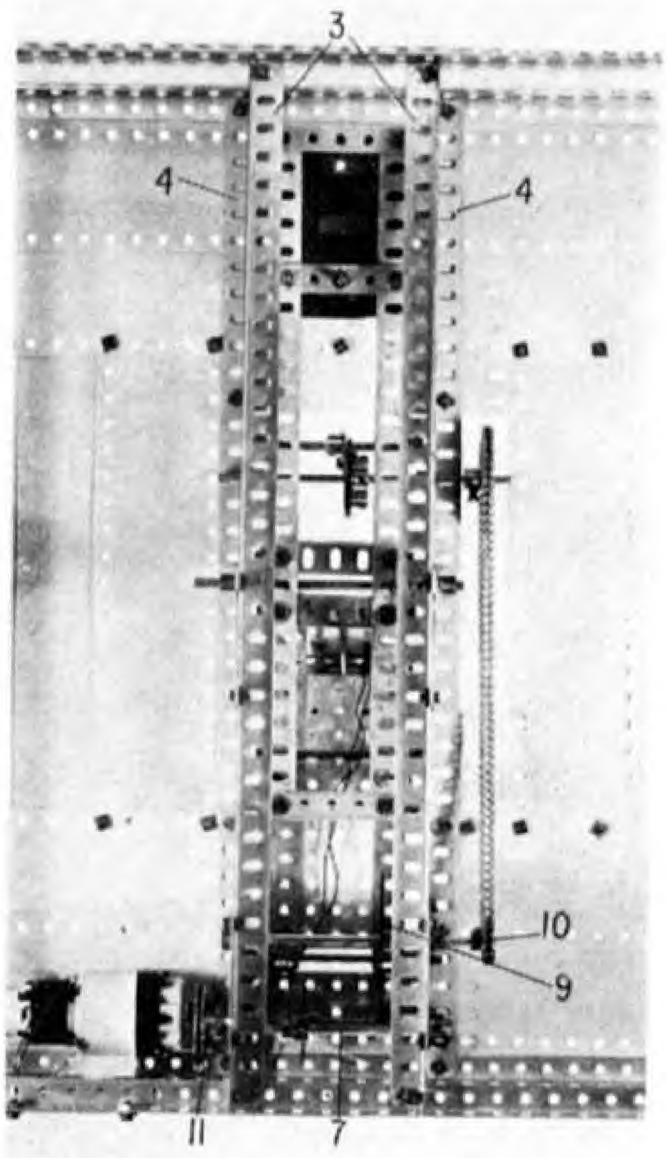
Suspended from the wheel-rim are eight chairs, all similarly built up from a 2½ × 1½ in. Flanged Plate, to the flanges of which two 1½ × 1½ in. Flat Plates 30 are bolted. The upper rear corners of the Plates are connected by a 2½ × ½ in. Double Angle Strip to which a 2½ × 1½ in. Flexible Plate is bolted to serve as a chair back, while a 2½ in. Flat Girder 32 is attached by Obtuse Angle Brackets to the forward edge of the



Left, a close-up view of the initial drive system for the roundabout tilting movement.

Right, an underside view of the base assembly showing the Motor with Gearbox which provides drive for the tilting movement of the roundabout.

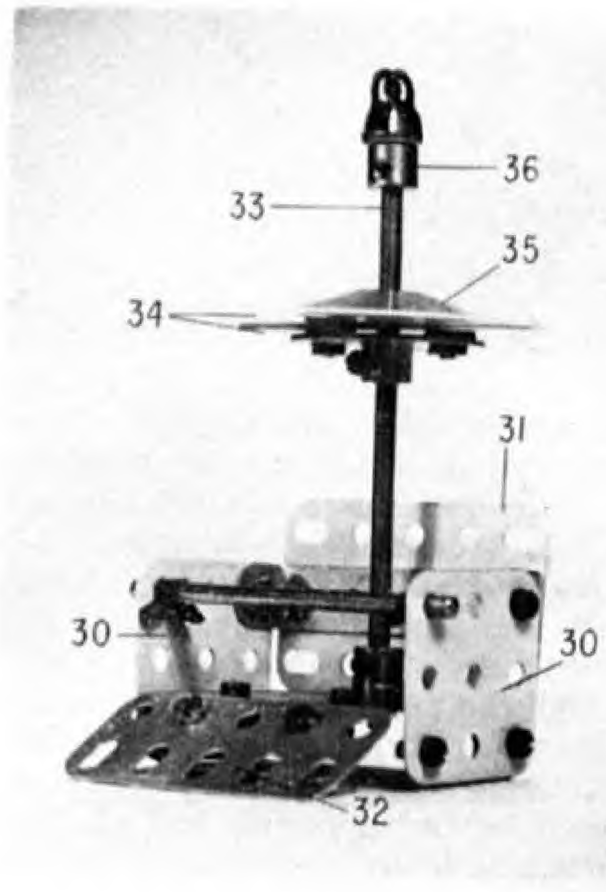
Below, a close-up view of one of the eight identical passenger cars, removed from the model.



Flanged Plate. A guard rail is supplied by a 3 in. Rod held by Spring Clips in the upper forward corner holes Flat Plates 30.

Fixed in the rear row centre hole of the Flanged Plate is a Rod Socket in which a 4 in. Rod 33 is held. Secured part-way up this Rod is an 8-hole Bush Wheel, to the face of which two Semi-circular Plates 34 are bolted, being spaced from the Bush Wheel by a Washer on the shank of each securing Bolt. A loose Conical Disc 35 is positioned on top of the semi-circular Plates, then an End Bearing 36 is secured on the upper end of the Rod. Pivotally held in the lugs of this End Bearing is a Hinge, the upper lug of which is secured to the wheel-rim, as shown.

Finally, a set of access steps for the model is provided by two $6\frac{1}{2}$ in. compound strips 37 bolted, along with two 5 in. compound strips 38, to the lugs of a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip fixed to one lower Angle Girder 1 in the position shown. The outer end of each Strip 38 is connected to the fifth hole down of Strip 37 by a $6\frac{1}{2}$ in. compound strip 39, the upper securing Bolt holding



an Angle Bracket in place and the lower Bolt holding a $2\frac{1}{2}$ in. Narrow Strip. The Bracket is fixed to upper Girder 1, while the upper end of the Narrow Strip is attached to the upper end of compound strip 37 by a $6\frac{1}{2}$ in. compound narrow strip 40 which serves as a handrail. An additional support is provided by a second $2\frac{1}{2}$ in. Narrow Strip 41, then, last of all, the step treads are supplied by six $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips bolted as shown between compound strips 39.

PARTS REQUIRED

16—2	2—15a	128—38	10—111c
2—2a	9—15b	15—48a	8—114
4—3	3—16	8—51	1—130
7—5	8—16a	3—53a	8—166
12—7a	1—21	25—59	1—167b
2—8	1—23a	3—62	8—179
2—8b	8—24	4—62b	8—187a
10—9	1—26	1—70	9—188
6—9a	1—26a	17—74	2—189
6—9d	1—26c	5—81	4—195
10—12	1—27b	1—94	10—196
16—12a	1—27c	1—95	16—214
1—14	16—35	1—96a	4—235
1—14a	342—37a	8—103f	4—235f
2—15	302—37b	2—108	2 Motors with Gearbox
		8—111a	

TRACTOR DRIVER *(continued from opposite page)*

he will have to be prepared to work in the evenings or at week-ends. While he never gets rich, he often enjoys his work because he feels well respected. After all, he has to work without supervision, and is in charge of machinery that may have cost £4,000 or more. When he knows the farm work inside out he could become a farm manager.

Other drivers leave the farm itself for contract driving which is more demanding but usually better paid. Many big contractors today started as drivers. It is one way to get a foot onto the farming ladder.



A line-up of Leyland tractors, models 384, 344, 253, & 154, with b.h.p. of 70, 55, 47, & 25 respectively.

Would You like to be a Tractor Driver?

asks Richard Lee



HAVE you noticed a big change which has come over tractors just recently? It is a common enough sight to see the solitary tractor creeping up and down a countryside field. Or maybe a busy team of three or four, all with different machines fixed to them, hard at work around a field gate in the country.

The biggest change to a casual observer must be the enormous number of tractors which seem to have suddenly 'sprouted' cabs for the driver to sit in. Three or four years ago the tractor cab was considered an expensive luxury and few tractors could be seen fitted with them. Now, certainly all the new tractors have them. The reason is due to a recent law which requires all new tractors to be fitted with, at least, a safety-frame. In the same spirit as car seat-belts, the Government felt legislation was needed to cut down the loss of life and tragedy in accidents which resulted from overturning tractors.

The safety-frame is really the same as a cab but it need not have windows or roof sheeting. It must be strong enough to withstand the tractor's weight should it roll over sideways down a hillside. In this way the driver within is saved from being crushed.

Yes, tractor driving can be hazardous for those drivers who don't take care or try to show off. Fields are not always as flat as roads, and the tractor surges with power in a very low gear as it pulls its strong



The David Brown 995 tractor hauling a three-furrow link-mounted plough.

implements through the ground. It is very satisfying to drive a tractor because one is not just going from one place to another, as with a lorry. One is actually doing something to the ground, or to the crop growing in the field. The driver is in charge of that operation, whether it be sowing seeds or spraying insecticide. He has to drive to exact limits so as not to cover any ground twice, nor to miss strips. If he drives badly, all the missed bits will soon show him up for what he is!

The tractor driver must be a responsible and intelligent person, besides being willing and hard-working. He must learn how to use all the new

A Track-Marshall 70C built by John Fowler & Co. (Leeds) Ltd., fitted with a heavy duty toolbar.

implements and to do the regular farm service work to his prime-mover. The modern cabs have brought a little comfort to the long spells of cold winter driving, and some tractors are fitted with radio-earmuffs to ease the boring jobs. Most jobs keep the driver fairly busy, though, as he has so much to pay attention to.

Many implements are not only towed by the tractor, but are fixed to it on a 3-point hydraulic lift linkage which picks it clean up at the touch of a button. Often the implements are powered from the tractor by a power take-off splined shaft, or by hydraulic power from the tractor's internal hydraulic pressure pump. The interior of the tractor cab is a maze of pedals, levers, switches and controls. They seem very complicated at first but they are soon mastered with practice.

A tractor driver earns about £20 per week and may get a free house to live in as well. During busy times

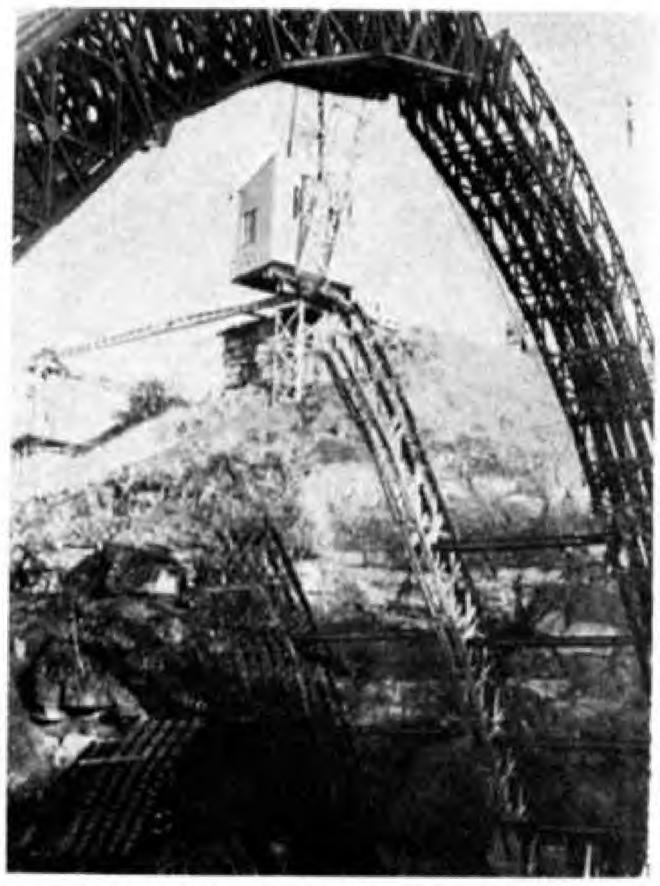
(continued opposite)



Interior of cab of a Dutra tractor; visible are at least ten lever controls and four foot-pedals, though the dash is fairly simple. Note sound-proofing panels all round.

Design and Construction of BRIDGES Part II-Bailey Bridges

By Terence Wise



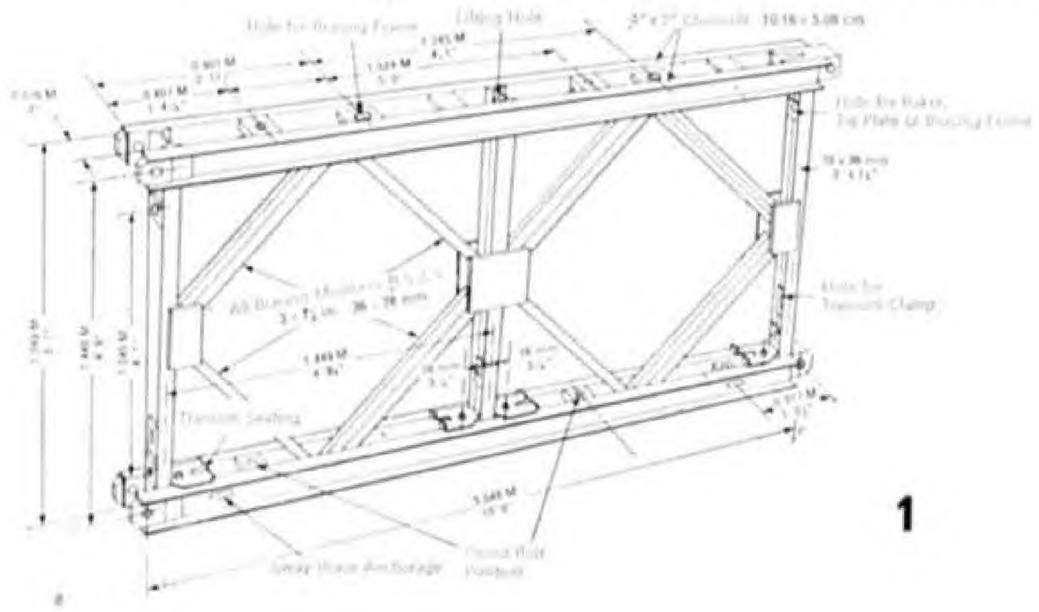
Bailey components being used as falsework for an in-situ concrete arch during a project in Scotland.

THE Bailey Bridge was invented by Sir Donald Bailey and may be briefly described as a bridge made up from steel parts, easily transported in standard three ton trucks, all capable of being erected by manpower alone and all of which are jig manufactured to precise tolerances so that they fit perfectly. All parts are interchangeable and because of this can be built up rapidly into all types of structures to meet varying requirements of span and load.

This system of bridge building proved of great value to the British and American armies in World War Two and soon became a standard method of bridge construction. Nowadays Bailey equipment is used throughout the world for all types of engineering structures, including piers, towers, access ramps, gantries and falsework and shoring for other forms of construction.

The original Bailey bridge was designed as a simple through bridge, i.e. the deck being carried between two main girders which spanned the gap. These two main load-carrying girders are composed of a number of steel lattice panels, each ten feet long by five feet one inch high, pinned together with alloy steel pins. (The pin holes are very tight connections and when panels are connected end to end the effect of local stresses can be ignored.) This Bailey panel is the basic component and the manner in which panels are grouped together decides the load the structure will bear. It has been found that the normal beam theory applies to structures made up of this panel, for the diamond shaped bracing in the panel is such that it acts as a composite plate beam, the upper and lower chords being the flanges and the vertical and diagonal components the plate web.

The strength of these main girders or trusses can be varied by adding extra panels alongside the first and/or adding storeys above them. Road bearers, called transoms, are then laid across the bottom chords of the panels, connecting them and at the same time spacing them at the correct distance throughout the length of the bridge. These bear the subsidiary steelwork for the bridge deck. Various bracing pieces and the decking sections complete the bridge.



1

Simple beam bridges of this type are normally built on rollers and pushed out across the gap to be spanned as each set of panels is assembled. A false "nose" is constructed of Bailey panels, added to the front of the structure, and this allows the beam bridge to be "launched" across the gap with the "nose" acting as a cantilever. Spans of up to 260 feet have been achieved by this method.

There are two types of decking: timber for temporary structures and a steel deck for permanent work. The latter is designed to be covered by asphalt or similar road-making materials. The roadway of a Bailey bridge is two feet four inches above ground level and therefore ramps are needed at each end, unless the baseplates are set below the ground. Ramp sections can carry axle loads of up to 15 tons when supported at each end, i.e. over their 10 feet length. Heavier loads can be taken if the ramp section is supported midway. However, the majority of vehicles cannot easily negotiate gradients of over one-in-ten, so a 20 foot ramp is required. This is constructed from two 10 foot ramp sections, supported in the middle by a transom.

Footways are normally fitted outside the main girders. These can have wooden or steel decks in two standard widths, three feet or four feet six inches, all designed to carry a load of 100 lbs p.s.i. They are supported on cantilever brackets which fit on the ends of the roadway transoms. Handrails are also supplied, three feet six inches high.

There has been considerable expansion in the range of parts since the early days and all types of bridge can be constructed from the basic Bailey components now available. The main parts used are shown in the figures and are described briefly below. The high tensile steel used has an ultimate tensile strength of 35-40 tons p.s.i., the mild steel a minimum yield of 15-25 tons p.s.i.

Bailey Panel (*Fig.* 1). High tensile steel, welded construction. The two chord members are interconnected by vertical and diagonal bracing. Panels are joined to each other end to end by engaging the lugs and jaws and inserting locking pins.

Bracing Frame (*Fig.* 2). Mild steel panel of welded angle and bar construction, used to brace the tops of the panels.

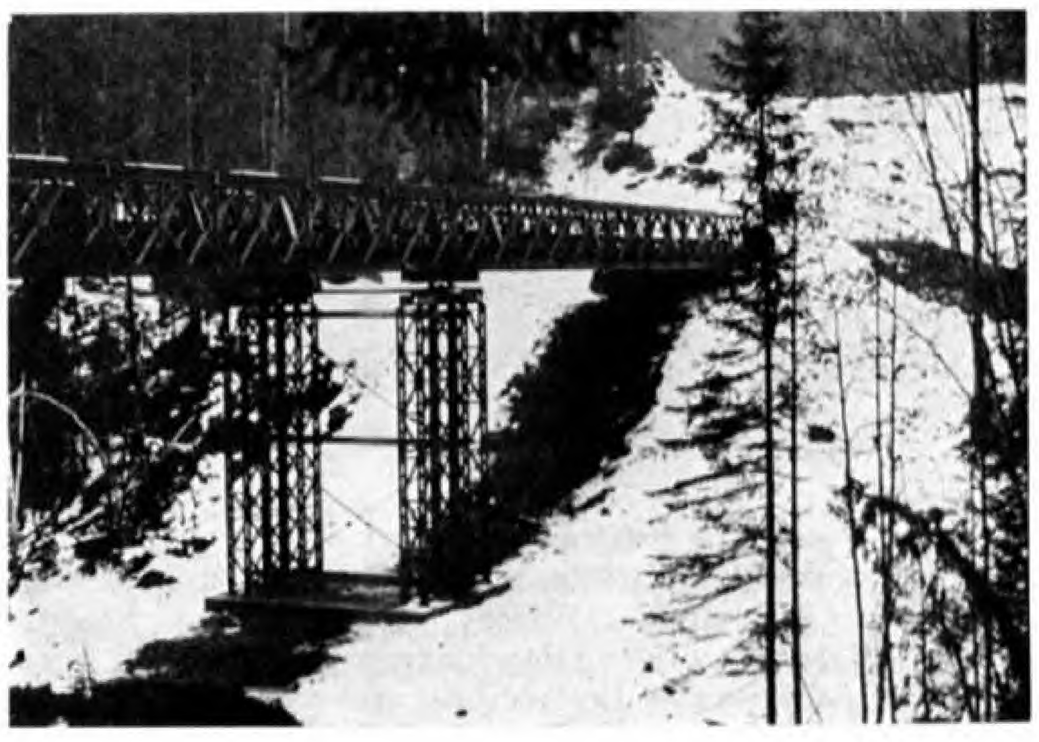
Raker (*Fig.* 3). High tensile steel joist which connects the top of one end of the transom to the top of an end vertical member of the panel. It is the main stabilising member of the bridge assembly.

Transom High tensile steel joist which forms the cross girder between the two main girders, thus bearing the bridge deck.

Stringer (*Fig.* 4). Three mild steel joists welded together to form a frame. It forms the longitudinal bearer for the roadway of the bridge and fits over lugs on the transom.

Baseplate To spread the load of the bridge evenly over

A 150 foot double/single reinforced Bailey Bridge with two supporting Bailey Piers.



an area of ground. Only four baseplates are required whatever the type of bridge—one at each end of each main girder. Of welded heavy gauge steel, the centre part forms a sunken "tray" to receive the bearings. *Ramp* Three joists of high tensile steel built up into a frame similar to the stringer but of heavier construction. *Rocking Roller* (*Fig.* 5). For launching the beam bridge this part consists of three rollers in an assembly with half round bearings at its bottom centre. These bearings fit over the bridge bearings on which the roller assembly is then free to rock. The four side rollers act as guides for the trusses. The maximum number of rollers for launching all normal spans is four, two either side under the first and second panels. Maximum load for a roller is 21 tons.

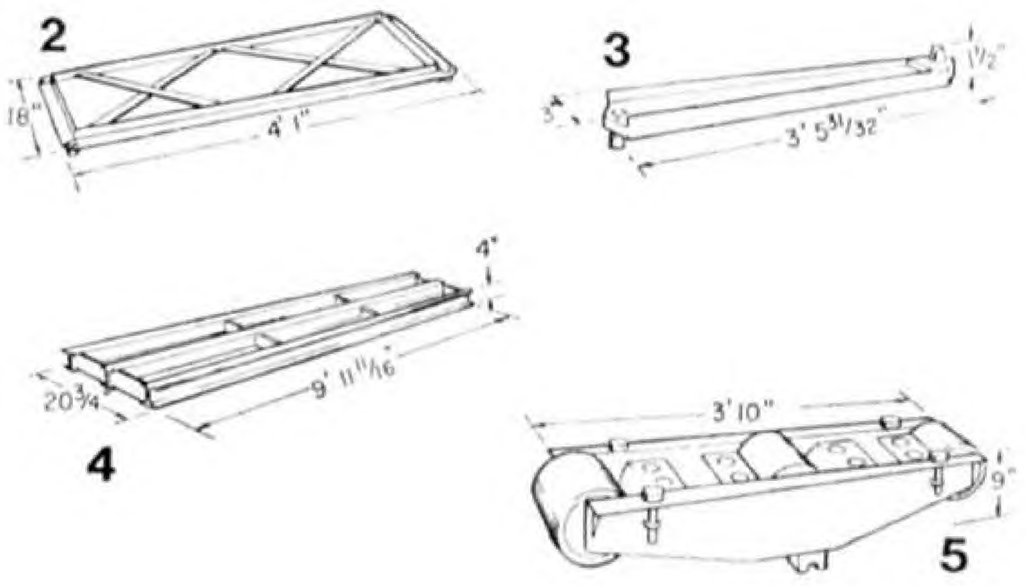
The original and simplest form of Bailey bridge mentioned earlier consists of a single truss of panels along each side of the deck and can be strengthened, or the number of decks increased, by adding other panels parallel to or on top of the first. However, one truss two storeys high is not used as this would be unstable, and the usual combinations are double or triple trusses for single double and triple decks. For example, a triple/double deck bridge has its main girders composed of panels arranged in three trusses side by side and two storeys high.

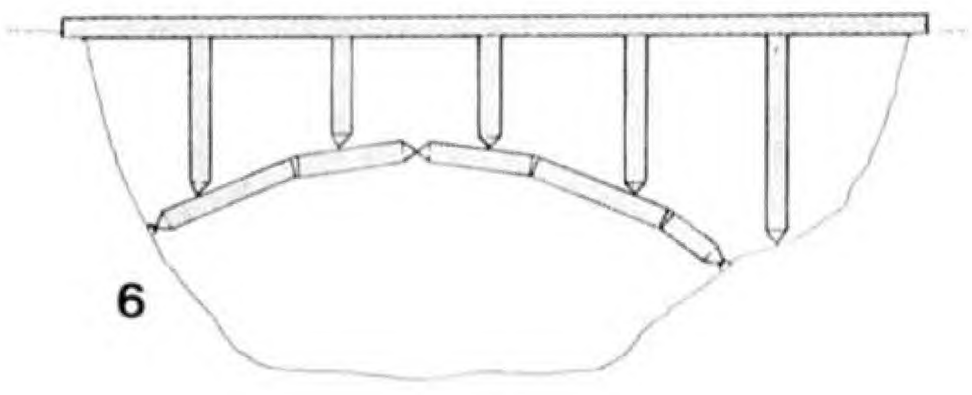
This type of bridge has a roadway 10 feet nine inches wide. Larger transoms can be used to create roadway widths of 12 feet six inches or 13 feet nine inches with the corresponding increase in the number of stringers to support the wider roadway. Where a roadway greater than 13 feet nine inches is required the only method with Bailey equipment is to build a deck type bridge in which the transoms and decking parts are carried on top of the trusses forming the main girders. The width is then only governed by the length of the transom and these are available up to 20 feet. Greater widths can, of course, be obtained by building another bridge with its transoms linked to the first.

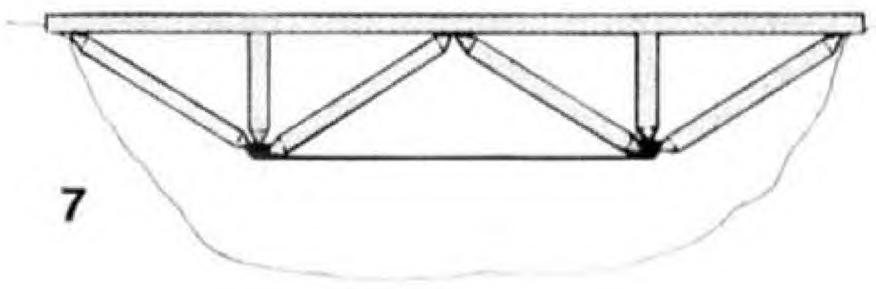
Continuous girder and broken span bridges can be constructed from the standard parts with the addition of two small pieces of equipment. Suspension bridges may be built by first erecting Bailey towers (exactly the same technique as for a beam bridge but erected vertically) then passing steel wire cables over them and so to the anchorages. Half the span is then built on each bank and launched outwards, the outer ends being supported by trolleys on the cables. The two halves are pinned together and the trolleys are then used to help fix the suspenders. This type of bridge enables the span to be increased to 400 feet without supports.

A lifting bridge can be built with a normal Bailey span and two Bailey towers at each end of the span. Running gear is required to raise the span up the towers and concrete foundations are necessary for the towers and the ends of the span. Single and double bascule, swing and retractable or roller bridges have also been designed and operated successfully with Bailey components.

In recent years new techniques have been developed for the building of arch bridges (*Fig.* 6) and under-stressed bridges (*Fig.* 7). Both types may be constructed from standard Bailey components and are particularly useful as falsework during the construction of reinforced concrete bridges. Single spans of 730 feet have been built with the under-stressed design, capable of carrying loads of up to 1500 tons.









Three quarters of a mile of dual carriageway in Bangladesh built with Bailey Bridging on Uniflote flotation. The bridge has an elevated span allowing 22 ft. clear above water level and a 100 ft. gap with inclined spans either side.

AIR NEWS

By John W. R. Taylor





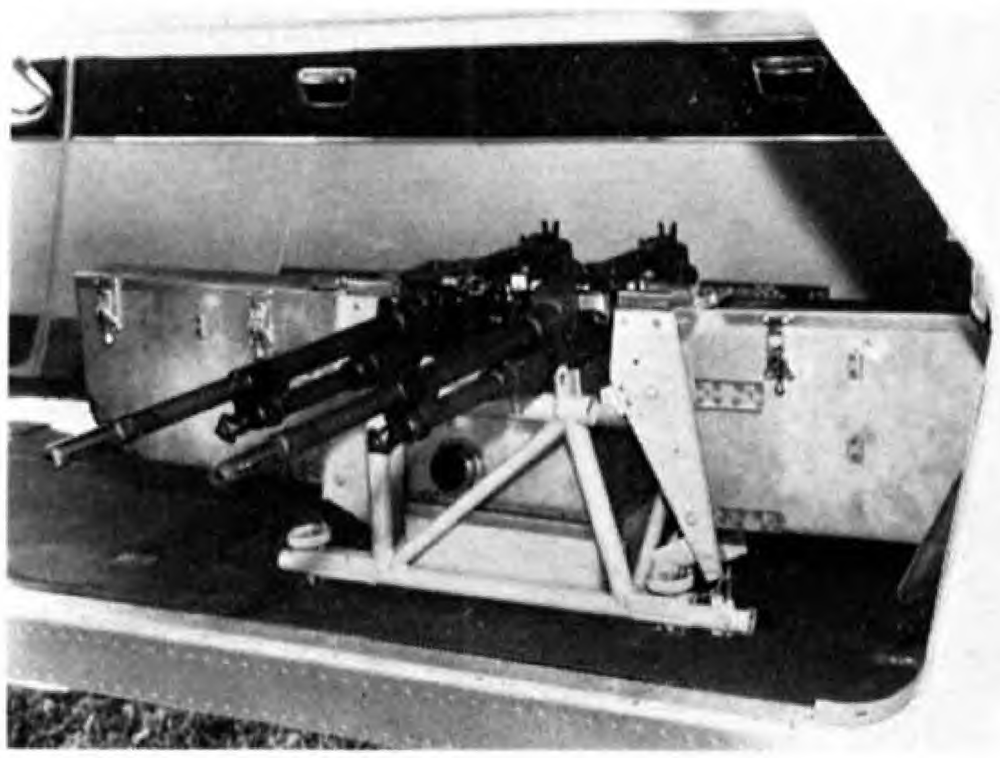
Britten-Norman goes European

BEST news from Britain's aircraft industry for a long time is that the Fairey Company has bought Britten-Norman whose Islander transport has long been one of the industry's best-selling and most imaginative products. This signals the end of the financial troubles which Britten-Norman suffered in the Autumn of 1971, and means that the Islander will now be backed by a big company with experience of aircraft design and manufacture dating back to 1915.

Fairey aeroplanes often set the pace for others to follow. In the 'twenties the Fox was the first really streamlined day bomber, nearly 50 per cent faster than the Fawn which it replaced. Fairey's Long-range Monoplane broke the World Distance Record in 1933, with a 5,309 mile flight from Cranwell to Walvis Bay in South-West Africa. The Fairey Swordfish, although a biplane in a monoplane age, was one of the truly great combat machines of the Second World War, with a long string of magnificent successes from Taranto and the *Bismarck* action to the grim war against the U-boats in the Atlantic. After the war the Fairey Delta 2 set up the first over-1,000 mph speed record, the Gyrodyne helicopter became the fastest rotating-wing aircraft in the air and the big Rotodyne pointed the way to a new generation of vertical take-off inter-city airliners for which we are still waiting.

Throughout much of this time, Avions Fairey in Belgium was producing combat aircraft designed by the parent company, and other types like the Gloster Meteor and Hawker Hunter, for the Belgian Air Force and its allies. It was also the birthplace of the little Tipsy lightplanes, like the well-known Nipper designed by its former Managing Director, Ernest Tips.

Now after more than a decade, the purchase of Britten-Norman puts Fairey back into the aircraft design and manufacturing business. The results should be exciting because it is intended to use the resources of Fairey S.A. (the former Avions Fairey) in Belgium to carry out much of the sub-contract work on Britten-Norman aircraft. In addition present manufacturing links with the Rumanian aircraft industry will be retained. The Islander and its sisters will, therefore, be true European products at the period when Britain is going "into Europe".



By the time these new developments were announced, in early September, a total of some 354 Islanders had already been delivered, more than 300 of them to customers overseas. The three-engined Trislander had begun to attract orders, the military twin-engined Defender version was available to anybody wanting an aeroplane able to carry troops, perform search and rescue duties, attack rebels or insurgents with rockets, bombs, missiles or machine-guns, and generally operate as a sort of one-design air force, and the little four-seater Nymph represented in prototype form an all-metal aeroplane that could be built up from prefabricated parts by any small nation wishing to establish its own aircraft industry.

As a start, Fairey will concentrate on the Islander, Trislander and Defender, but there is no question of simply being content to build well-proven designs. A prototype, registered G-BAAE, which was displayed for the first time at this year's SBAC show at Farnborough, represented yet another permutation of the basic Islander. Its lengthened nose increases the baggage capacity by 28 cu. ft. Two additional windows in the rear fuselage indicate where the interior has been cleared to make room for two more seats. Thus, G-BAAE carries twelve persons instead of ten, without requiring any more engine power. The airworthiness authorities have, in fact, authorised a 300 lb increase in permissible take-off weight to 6,600 lb, making the Islander even more of a money-spinner for its operators.

Shorts stretch the Skyvan

The Islander was not the only familiar type with a rather different shape at Farnborough. On their stand



in the exhibition hall, Shorts had a model of an interesting new 30-passenger light airliner which clearly inherits features of the popular Skyvan and Skyliner series. Known as the SD3-30, it is intended to meet the needs of the third-level local airline market in the mid-seventies, by which time the present generation of aircraft, such as the 16/20-seat Beechcraft 99 and Twin Otter, may be getting too small to cope with expanding traffic.

The outer wings, fuselage cross-section and tail unit of the SD3-30 may be reminiscent of their counterparts on the Skyvan, but the rest of the aircraft is very different. Shorts refer to it, with justification, as a wide-bodied feederliner, with spacious accommodation for ten rows of three-abreast seating plus a cabin attendant. There will be a galley and toilet, with ample baggage space in in nose and rear compartments.

Choice of two 1,070 hp Pratt & Whitney PT6A-45 turboprops, built in Canada, will help to make the SD3-30 a favourite with both passengers and people living around the airports it serves. Each engine will drive a low-speed four-blade propeller, giving low noise levels and smooth flying. It will be possible to stand up in the cabin without bending, and operators have a choice of large hat racks or overhead baggage lockers over the seats.

For mixed passenger/freight operations, a bulkhead will be available to divide the interior into a rear passenger cabin and a forward cargo hold able to take standard D-size containers.

Alternatively, a cargo-only version will be offered, able to carry 7,500 lb of freight, including seven D-size containers. A full payload of passengers or freight will be carried nearly 350 miles; maximum range will be 965 miles at 230 mph with normal fuel. What is more, the SD3-30 is being designed to operate from runways only 3,500 to 4,000 ft long.

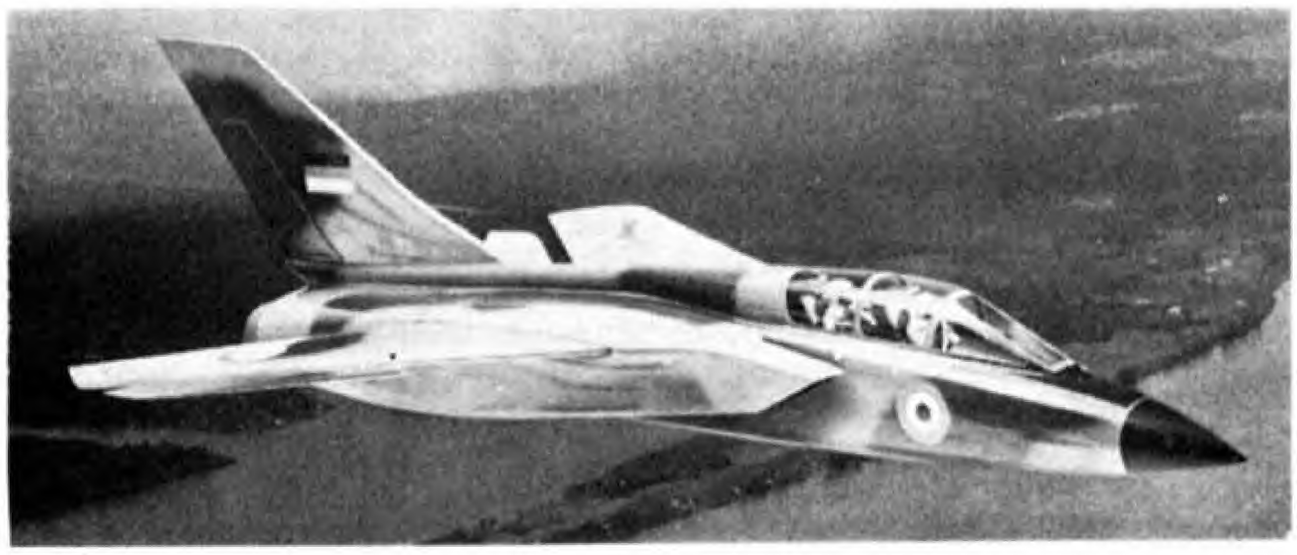


Skyspy

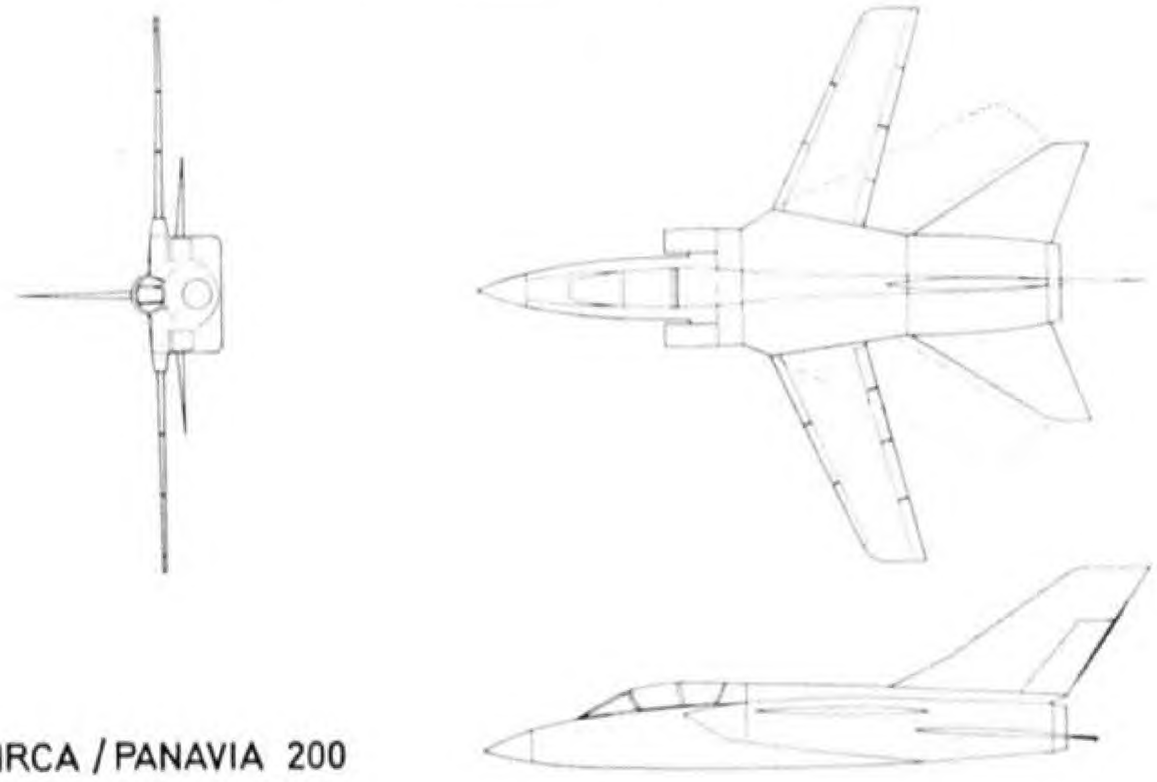
In our modern world we have become quite resigned to the fact that everything we do is being watched day and night by reconnaissance satellites which orbit silently and invisibly far above our heads. They are, of course, expensive devices, and no army commander in a small, local battle area would expect to be able to direct a satellite at a moment's notice to find out what is over a nearby hill or round a corner. That is why Shorts have devised the Skyspy.

Only three and a half feet in diameter, it consists basically of a cigar-shaped centre-body inside a ring-shaped wing. A small two-cylinder piston-engine in the centre-body drives a low-pressure ducted fan at a top-speed of about 400 mph to provide the propulsive force. Aerofoil surfaces set in the rear of the duct provide full control in flight, in response to signals from an operator on the ground. Range, speed and endurance can all be varied to meet specific requirements of the customer.

Skyspy could carry a wide variety of equipment, ranging from reconnaissance cameras to TV "eyes" for target spotting, forest fire patrol and coastguard surveillance. It could transport light relief and medical supplies, would be a difficult target for an enemy to shoot down, and could far out-perform unmanned



Pictures on opposite page show, from the top down, the Defender, military version of the Islander, firing rockets, the Trislander, guns in the cockpit of the Defender, and the latest Islander with long nose & 12 seats. This page, top, the projected Short SD3-30, left an artist's impression of the Panavia Multi-role Combat Aircraft (M.R.C.A.) &, below, the Short Skyspy.



MRCA / PANAVIA 200



helicopters of similar cost. All of which makes it quite a "toy".

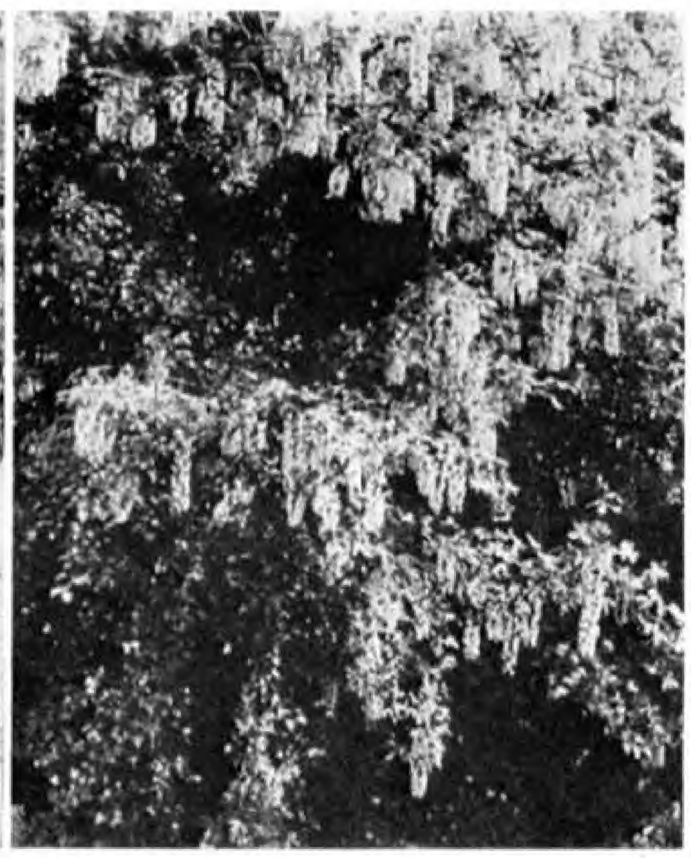
MRCA up-to-date

From one of the simplest military projects currently being studied we move on to the most complex and expensive warplane ever designed and built in Europe—the MRCA. The initials stand for multi-role combat aircraft and that is exactly what this swing-wing machine is intended to be. The RAF will use it to replace huge delta-wing Vulcans, Buccaneers and Phantoms for a variety of attack, reconnaissance and air defence duties. The Germans and Italians plan to re-equip their present Starfighter and Fiat G91 squadrons with MRCAs. The total number likely to be built initially is around 900, with 350-400 going to the RAF, 420 to the German Luftwaffe and 100 to the Italian Air Force.

Few details may yet be published, even the dimensions being regarded as secret. Prime contractors for the airframe are BAC of England, Messerschmitt-Bölkow-Blohm of Germany and Aeritalia of Italy. Between them they are manufacturing nine prototypes, of which the first is scheduled to fly late next year. Each will be powered by two RB.199 afterburning turbofan engines, produced by Rolls-Royce, MTU of Germany, and Fiat of Italy, who have formed a company named Turbo-Union for the purpose. In the same way the airframe manufacturers have formed Panavia Aircraft to manage the programme.

With a top speed well above Mach 2, and packed with the very latest electronic equipment, the MRCA promises to restore much of the RAF's old offensive power.





Nature's Deadly Harvest

by Peter Wilkes

Far left, the Major Oak in Sherwood Forest, Nottinghamshire, is a great attraction to children yet even the old established Oak can present danger to health if the "fruits of the tree" are eaten. Left, the Laburnums whose yellow tracery so delights the eye, can, when flowers give way to seed pod, be a deadly and indiscriminating killer should its forbidden fruit be sampled by the unwary.

The tragedy was frightening through its sheer simplicity. The glorious sunshine of late Autumn, the woods, with the carpet of falling leaves crisp underfoot and, pushing their way through that golden layer, the so familiar shape of the mushroom, the one edible type of fungus that is universally looked upon as a delicacy to impart fragrance and flavour to even the tastiest meal.

Soon the basket on the woman's arm was filled with this bountiful gift from nature's harvest and, with her eleven year old daughter clasping her hand, she retraced her steps through the peace and tranquillity of the countryside to her home.

It was the last walk that either she or the girl, who played so happily while her mother prepared their "find" into a tasty evening meal for the family, were destined to take. Within seventy two hours of eating those "mushrooms" mother and daughter were dead, and two sons only recovered, after weeks on the critical list suffering from "toadstool" poisoning, through the skill and care of the hospital doctors. For the "mushrooms" that the woman had collected so eagerly on that fateful afternoon, were none other than the dreaded "Death Cap" species of the "Toadstool" family, as all poisonous fungi are loosely called.

Although this incident happened in Belgium and a repetition in England is hard to foresee, it does illustrate the ever present dangers from "Nature's Deadly Harvest" that abound in the countryside, waiting for the unwary and unknowledgeable. For the "Death Cap" is as familiar in our woods and forests as it is in those of other European countries, and is responsible, with unfailing regularity, if not for actual fatalities among those unwary enough to associate it with the familiar mushroom, for many cases of the sickness and suffering which occur every year through poisoning from nature's deadly growths.

Danger, from the many poisonous plants and fungi which abound in hedgerow, woodland and pasture, comes either, as in the case of the "Death Cap", from their similarity in shape and colour to that with which we are so familiar, or through their very colour, which, standing out in sharp contrast to the drabness of their surroundings, provides a temptation that many find hard to resist and, in at least one or two cases annually, with fatal results.

Vigilance, when in the country and among species of plants and fungi that are unknown to you, can never be relaxed, for as attractive as the "Fly Agaric" fungi may seem with its brilliant scarlet cap surmounted by white warts, those unwary enough to taste this forbidden fruit will find that within three hours the onset of the poison can, after unpleasant stomach pains, find one in a coma and hospital attention essential.

Many may find the "Red-staining Inocybe", that species of the "toadstool" family that, when handled or bruised, changes from its normal white colour through to vermilion, fascinating to experimenting with, but if those experiments are carried on, then another name can easily be added to the statistics kept by the Ministry of Health recording deaths from "Nature's Deadly Harvest".

Possibly one of the best known of our poisonous plants and trees is the Yew tree, whose berries, when they turn from their early green colour to a brilliant red that stands in sharp contrast to the evergreen leaves, provides a temptation that many, when first seeing this new type of

fruit in nature's gardens, find difficult to ignore, but, as in so many cases, to resist temptation is the only sure way of avoiding not only severe illness, but every likelihood of fatal consequences, for death, from Yew poisoning, is swift and survival rare. Because the Yew, potentially the most dangerous killer of the countryside, was so well known to our forefathers, and provided the wood from which archers cut their bows, it was grown only in churchyards, and hence has remained safely out of the reach of those who, if it had been allowed to grow in wood and forest, would have found its forbidden fruits hard to resist.

Although not as dangerous as the lethal Yew, the berries of that so familiar Christmas decoration, the Holly, are another of nature's traps for the unwary. And, although fatal results are unknown, anyone who, in the belief that what is brought into the home is safe, treats the holly berry as a form of fruit, will truly regret his action, for not only are the results of the holly poison emetic, but also purgative.

In stark contrast to the unpleasant but relatively harmless effects of the Holly is the fruit of the most appropriately named "Deadly Nightshade" for here, among all of the potential harmful plants with which nature has inhabited our countryside, the "Atropa belladonna" is in the case of adults as well as younger persons, a killer. A perennial, herbaceous plant, growing in the months of June to August, in the South of England, to heights of about 5 ft., and with a tempting harvest of berries that change through green and red to the shining black fruit the size of a cherry that so many people have mistaken for an edible fruit, "Deadly Nightshade", of all poisonous plants fully deserves its name. For, while it is estimated that a normal, healthy adult would have to eat between 10 and 20 of the berries before death was caused, the fatal dose, for anyone other than one hundred per cent fit, would rapidly decrease according to their degree of fitness until, in the case of a young child, even half of one of those tempting fruits could bring a death from which there is no escape.

Yet, through one of those strange tricks of nature, other members of the same family, the "Woody Nightshade" with its tempting red berries, and the "Black Nightshade" bearing fruit that is strongly reminiscent of the familiar blackcurrant, if their fruits are eaten, will result in unpleasant illness, although fatalities are rare.

No one should underestimate the power of "nature's deadly harvest" for history recalls that it was a draught made from the weed "Hemlock", so familiar during the summer months in the fields and hedgerows, that caused the death of Socrates, and yet it is this same Hemlock that yields the thick, hollow stalk that so many youngsters use as a peashooter, blow pipe and even imitation telescope, little realising, as they lift it to their lips, that they are truly "playing with death".

Although it is to the country that one's thoughts usually turn when poisonous plants and fungi are considered, illness and even death lurk in nearly every garden, and even that with which we are most familiar can hold tragedy if it is abused.

The Laburnum tree, with its delicate gold tracery that hangs from its branches from May to June, can be seen bringing colour and brightness to many gardens during the summer months. When, however, those yellow flowers give way, as the seasons progress, to the fruit pod with its small kidney-shaped seeds, colour and brightness can turn so easily to tragedy and death for, among children in particular, the seeds of the Laburnum, resembling, as they hang from its branches, the familiar pod of the edible pea, are responsible for a large majority of the cases of poisoning that occur in this country each year.

Another familiar sight in the garden is the Lupin, and yet there is another potential killer for, as with the Laburnum, the seed pods, as the glory of the flowers dies away, and the plant begins its reproduction cycle, are so easily mistaken, by young children in particular, for that so familiar pea and, when the seeds of the Lupin pod are handed round from friend to friend, a serious outbreak of poisoning can easily result.

If proof is necessary that none of nature's bountiful harvest should be used for experimental purposes to devise a new "food" for the table, it is the humble potato that provides it. Used in every household and loved by adults and children alike, the potato, if the green sprouting tubers, leaves or stems are eaten, can bring death.

The death list, if garden or countryside are abused, is almost endless. The common privet hedge, the beautiful lily-of-the-valley, the laurel, all are of potential danger to humans, but if the code of the countryside is remembered, "never eat that which is unfamiliar to you", nature's deadly harvest can greatly add to the enjoyment of our English environment, since among them are some of the most colourful and beautiful of all our plants.

Left, another familiar sight in the countryside and yet another whose seeds, if unwisely experimented with, can bring pain and suffering—the Rhododendron. Centre, like the Laburnum, the Lupin, when the glory of its flowers die away and its "pea" like pod appears, is a danger to any who may be tempted to taste the forbidden fruit. Right, although a draught from the Hemlock is alleged to have caused the death of Socrates, children still delight in using the hollow stalk for blow pipes, pea shooters and even imitation telescopes.









This close-up of Dinky Toy No. 683 Chieftain Tank clearly shows the cupola which controls the elevation of the gun barrel.

Dinky Toys News

A Military Year

By Mike Peddie and Chris Jelley

FOR the Dinky Toy collector, 1972 must go down in history as the Year of the Military Model. During this year—and particularly during the latter half of the year—more military vehicles and aircraft have been introduced than any other single type of model. We have had an Armoured Car, a Messerschmitt BF109E and a Stalwart Load Carrier, as well as other models in a similar vein, and we are now able to report that the well of ideas is still far from exhausted. All this month's new releases are military models, also!

Chieftain Tank

First in line is Dinky Toy No. 683 Chieftain Tank and this should, in our opinion, be described as a "masterpiece" rather than just a mere "model". It is probably the finest military reproduction ever to appear from the Dinky Toy stable—certainly as far as play-value is concerned. Produced to 1/50th scale, it sports a wealth of realistic casting detail which includes outline representations of hatches, armoured panelling, lights, exhaust pipes, lockers, grilles and numerous other features present on the real Chieftain. Also like the real Chieftain, it runs on working caterpillar tracks, has a revolving gun turret that swivels through the full 360 degrees and, of course, has the distinctive tank "big gun" projecting from the turret like an awe-inspiring finger of destruction!

This gun is actually the focal point of the model's play value. For the first time on any Dinky Toy vehicle (as opposed to a "separate" gun such as the 105 mm. Howitzer), it elevates and lowers and, in this instance, movement is achieved, not simply by moving the gun barrel up and down by hand, but by a special mechanism carried inside the turret. The wheel controlling this elevating mechanism indicates a touch of genius on behalf of the designers—it is cleverly disguised as the tank commander's "cupola" on the top of the turret. Revolving the cupola raises and lowers the gun through an arc of approximately 10 degrees.

The elevating feature, however, is not the end of the story: most interesting of all, the gun actually shoots! Built into the barrel is a spring-loaded firing mechanism, cocked by means of a small lever at the inner end of the barrel, and it

Two of the new Dinky Toy Chieftain Tanks in a desert setting. Note the highly detailed castings and general standard of realism.





Left, seen here in simulated flight is the new U.S. Army T42A. This model will undoubtedly make a superb addition to the ever-increasing range of Dinky Toy aircraft. Right, a close-up view of Dinky Toy No. 712 Army T42A with its engine cowls removed to expose the detailed engine representations—just one of the many features that make this model so appealing.

shoots small plastic "shells", six of which are supplied with the model. It will also accommodate matchsticks which means that there is little chance of ever running out of ammunition, It's great fun, as we can confirm from experience!

The Chieftain is a good quality model manufactured in strong die-cast metal, with a tough polypropylene baseplate. It is finished in a military matt olive colour, with some trimmings in black, and has grey caterpillar tracks. With the gun forward, it has an overall length of 217 mm. ($8\frac{9}{16}$ in.), a width of 74 mm. ($2\frac{15}{16}$ in.) and a maximum height, with gun elevated, of approximately 92 mm. ($3\frac{5}{8}$ in.). Overall length with the gun trailing is 199 mm. ($7\frac{27}{32}$ in.). The model retails in the U.K. at a recommended price of £1.49—rather costly, but well worth the money.

Full-Size Details

Before moving on to the next new Dinky release, it is interesting to take a quick look at the full-size Chieftain. The first prototype Chieftain Tank was completed in 1959, after many years of development, and its purpose was to replace the slightly dated Centurion Tank which went out of production in 1954 after a successful fighting career. The General Staff in London stipulated that the replacement for the Centurion was to have a more effective gun and armour with an automotive performance at least as good. The Chieftain more than meets those requirements.

Power is supplied by a giant 19 litre, multi-fuel 2-stroke engine which produces an output of 750 b.h.p. and enables the tank to successfully traverse almost all types of terrain. It can even travel through water up to 3ft. 6 in. deep and, if fitted with special schnorkel "breathing" attachments, it can wade through water up to a depth of 15 feet! With a full load of 195 gallons of fuel, it has a road range of some 250 miles and will travel at a maximum speed of 25 m.p.h.—the tank being deliberately governed to travel no faster than this. Main armament is a 120 mm. Lll gun capable of firing eight rounds per minute, while the secondary armament consists of two 7.6 mm. Machine Guns, one under cover and the other mounted externally on the turret. It carries a four-man crew and is, without doubt, a fine piece of fighting equipment—a fearful opponent in any battle.

U.S. Army Aircraft

To pass on, now, Dinky's second new release is a U.S. Army T42A—a model which will make a superb addition to the ever-increasing range of Dinky Toy aircraft. This is the fourth consecutive month that Meccano have released a new aircraft, which is a good indication of their popularity.

In reality, the T42A is a military version of the existing civilian Beechcraft Baron, but it is, to our minds, a more appealing version judging by our Dinky review model. This, although basically similar to the Dinky Baron, is made to look considerably different by the inclusion of wing-tip fuel tanks and a subdued, but smart colour-scheme of all-over matt dark green, set off by black engine cowls, propellers, wing tanks and undercarriage, white aircraft identification letters and the traditional white American star on a blue disc flanked by red, white and blue "Wings" (Try saying that all in one breath!). As with the Baron, however, other features include, cabin seats, glazed windows, removable engine cowls and a retractable tricycle undercarriage, this last hand-operated. A jewelled "headlamp" is carried in the nose.

Identified by Sales No. 712, the T42A is produced to 1/77th scale, which results in a wingspan of 153 mm. ($6\frac{1}{32}$ in.) and an overall length of 112 mm. ($4\frac{13}{32}$ in.). It makes an appealing model at a recommended U.K. retail price of 75p.

Gift Set

Dinky's final release this month has no doubt been produced with the Christmas market in mind, being a three-model Gift Set which would make an ideal Christmas present. Identified as No. 677 Task Force Gift Set, it consists of three recently-introduced military vehicles in the shape of the Ferret Armoured Car, the D.U.K.W. Amphibian and the Stalwart Load Carrier.

The idea of Gift Sets is not new, of course, but this particular example is especially interesting as both the Ferret and the D.U.K.W. have been finished in different colour schemes exclusively for the Set. Instead of their original matt olive green, the Ferret is finished in the stone desert camouflage colour used on the Messerschmitt B.F.109E, whereas the D.U.K.W. is finished in a blue-grey colour reminiscent of that sometimes used on Royal Navy ships and equipment. The Stalwart remains green. Serious collectors will be particularly interested to learn of the colour differences, therefore it is important to stress that the Ferret and D.U.K.W. will be available in the new finishes *only* in the Gift Set. It will not be possible to buy the models separately, other than in their current finish of olive green. The recommended U.K. price of the Task Force Gift Set, incidentally is 89p—remarkably cheap considering it contains three models.



Meccano Parts and How to Use Them

Part 12—Power supplies for motors, etc

By B. N. Love

IN this final chapter of this series of brief articles on using Meccano parts we will look at the power supplies required for operating Meccano motors.

Two distinct types of electric motors are currently available for Meccano models, one type being a 'universal' A.C./D.C. motor, the E15R, and the other being D.C. only, such as the 3–12 volt Motor with six-speed Gearbox and the 4½ volt reversible Motor. Generally speaking, the E15R motor is driven by means of a mains transformer which reduces the 240 volt household mains (in the U.K.) to an output of approximately 15 volts A.C. Although Meccano Ltd. no longer market a transformer of any sort, units bearing the name HORNBY, MARSHALL, or MECCANO have been produced over the years at Binns Road and it is useful to know which transformer is required for which motor.

Fig. 1 shows a Hornby transformer known as a T20 which stands for "Train; 20 volts" and was made principally for operating 20 volt Hornby locomotives. It can be seen from the illustration that a speed controller is built into this transformer and two sockets are provided so that radio type wander plugs can be used for making connections to the electric rails. Such a speed controller depends on a coil of resistance wire looped between five of the contact studs showing and, as the lever is moved from stud to stud, the resistance is increased, or decreased according to the direction of rotation of the lever. Theoretically, this gives a speed control of the motor connected to the transformer. However, the current flowing through the motor also flows through the resistance wire and this is fine so long as the motor has a constant load. In the case of a Hornby 'O' gauge 20 volt locomotive, the running current was reasonably constant and the speed controller is reasonably effective. One interesting point here; it often comes as a surprise to Meccano modellers using the T20 for Meccano electric motor control to find that the first position on the controller next to the "off" position is full speed! This is quite a deliberate design feature to enable a locomotive to get a full "burst" of voltage when at a standstill in order to overcome the inertia of the locomotive and its rolling stock.

An E15R motor, or its predecessor, the E20R motor, can certainly be run from the T20 transformer, but the speed regulation will be poor for different load conditions. The harder the motor is required to drive, the more current it consumes and the more voltage does it drop across the resistance wire behind the controller contact studs. Fig. 2 shows the type of transformer which was designed for motor driving as its title implies, i.e. the M20 (Motor – 20 volt). As no resistance wire is included with this transformer there is a constant 20 volts available at the terminals under normal load conditions which permits the motor to run at its design speed. If the constructor requires

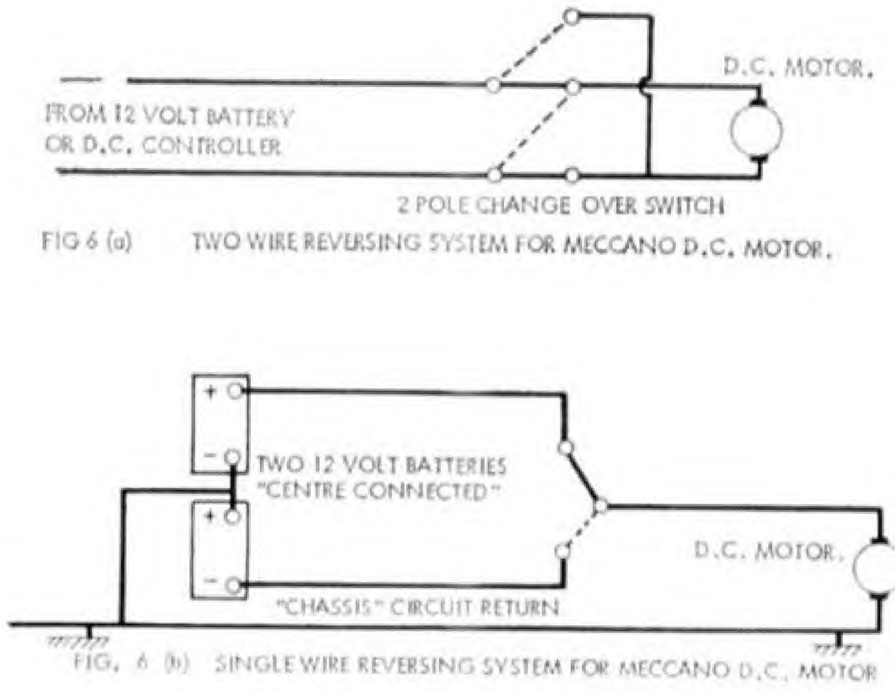
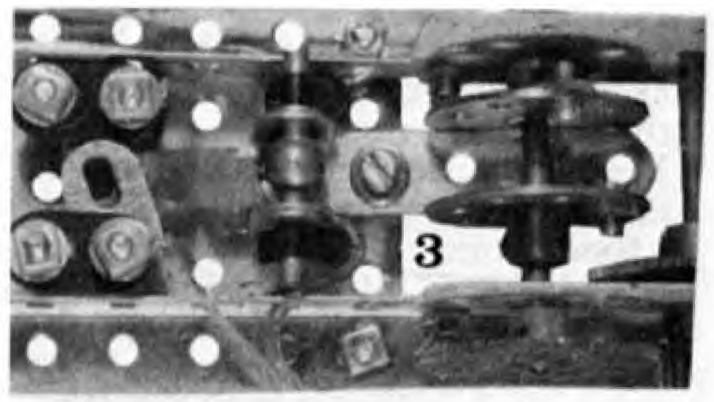


FIG 6 (a) TWO WIRE REVERSING SYSTEM FOR MECCANO D.C. MOTOR.

FIG. 6 (b) SINGLE WIRE REVERSING SYSTEM FOR MECCANO D.C. MOTOR



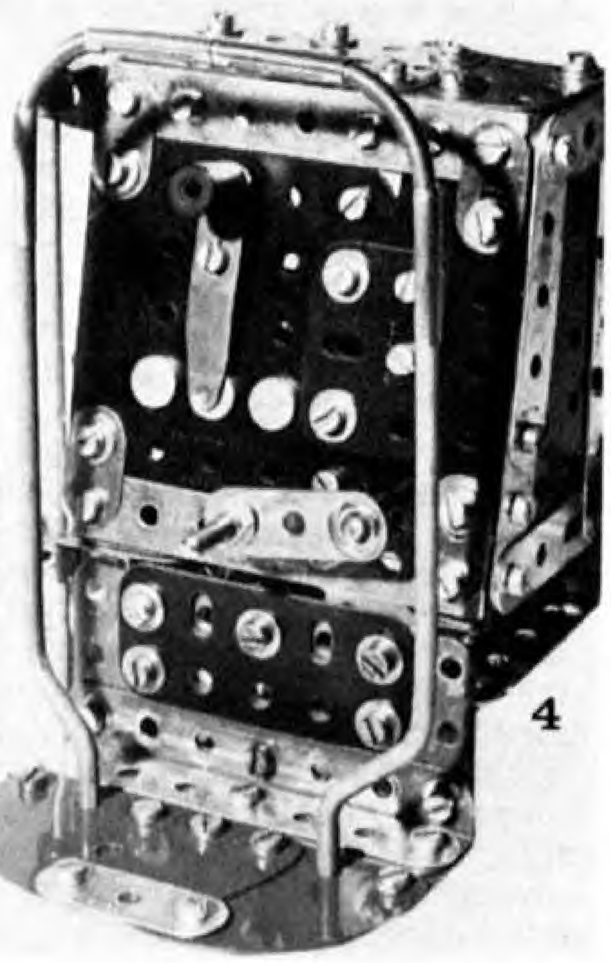


Fig. 1 Hornby transformer Type T20 for 20 volt locomotives with speed controller. Fig. 2 Similar transformer Type M20 for 20 volt Meccano A.C./D.C. motors such as E20R and E15R. Fig. 3 One way of making a two-way switch, mechanically operated, from Standard Meccano and Electrical parts. Fig. 4 Another two-way switch, hand-operated, also made from standard parts. Fig. 5 Meccano electrical parts used to make a neat distribution board on the control platform of a giant crane.

low speed outputs from the E15R then he should arrange gearboxes to give the necessary output speed and power.

As mentioned above, Meccano Ltd. no longer market a transformer of any sort, but all current Meccano motors will operate successfully from the Meccano Battery Box which gives D.C. outputs of 4½ and 12 volts. If a Mains source is preferred, however, then any of the popular model railway power control units will generally prove adequate, such as those manufactured by Rovex and Hammant and Morgan.

By far the most versatile of electric motors for Meccano models is the 3–12 volt D.C. Motor with Gearbox, as illustrated in Fig. 5. Three motors are shown in this illustration where they form part of the main drives to a Giant Block-Setting Crane. When fully ballasted with counterweights the model weighs over half a hundredweight but is driven along a set of rails via four bogies by one single 12 volt D.C. unit and, since much of the bulk of the motors illustrated is taken up with internal gear reduction trains, the small diameter motor incorporated gives a surprising power output.

As the D.C. power unit uses a high quality ring-field magnet for its 'field', it requires electrical connections only to the armature and when these are reversed, the direction of rotation of the armature is also reversed. In the case of the E15R motor, however, no fewer than four connections need to be changed over, unless structural modifications are made to the motor. Because the D.C. unit reverses so easily, it is very suitable for remote control and the circuit diagram of Fig. 6(a) shows the connections and switch required for this operation.

There are occasions when a model may be fitted with a number of D.C. units operating the various motions of a crane and the number of leads for remote control increases accordingly. However, there is a method of remotely controlling these D.C. motors by the "one wire method" which uses the metal chassis of the model as a common return path for all of the motor circuits. Fig. 6(b) shows how this is done, but two power sources are required for the operation. These could be supplied by two Meccano battery boxes or two D.C. controllers operating from the house mains so long as their output leads are independent and not separately 'earthed'. The important thing to ensure is that, when the battery or D.C. supplies are linked, one battery has its terminal "positive with respect to centre". The 'centre' in this case is the junction of the other two battery terminals according to the polarity indicated in Fig. 6(b).

Thanks to the versatility of the Meccano Electrical parts, the required switches can be made from standard items. Fig. 3 shows a single-pole 2-way switch made from Meccano parts and this one is operated by boltheads in a Bush Wheel providing automatic sequencing in a programmed model. A simpler hand-operated switch is shown on the front of a mobile crane trolley in Fig. 4. In this case, the switch studs are electrical Contact Studs (Part No. 544), the centre Stud being disconnected and merely providing smooth passage of the Wiper Arm above, which is pivoted on a Bolt lock-nutted to the fibre Insulating Plate forming the switchboard at the front of the trolley. The addition of an Insulated Spacer to the second hole of the 2 in. Wiper Arm forms a hand-knob for operating the switch.

It would be quite impossible here to illustrate the tremendous scope of the Meccano electrical parts in both elementary and advanced model-building, but the reader should be encouraged to exploit their possibilities in adding realism and control to his models. Some constructors, incidentally, will be familiar with the electrical Insulating Plates and Strips in black finish. This is obtained by loading the basic material with carbon black which gives an excellent surface finish but unfortunately it can also make the original fibre mix somewhat brittle. To improve the mechanical strength of the electrical fibre parts therefore, the carbon black is omitted in current production batches and the amber colour now supplied is the basic colour of the fibre when bonded.

Looking back over the past 12 chapters it is obvious that it has been possible to touch on just a few salient points in the use of Meccano parts, scope for which is virtually endless. However, I hope the areas we have covered have been of interest and help to aspiring modellers and, if this is so, then the series has been worthwhile.

The author will always welcome correspondence on Meccano topics and readers interested may write to him at 61 Southam Road, Hall Green, Birmingham 28. A stamped addressed envelope should be included if a reply is required.

---

500 Mountains Could Blow Their Tops

By Sam Napier

AS the boiling lava flowed down the slopes of Mount Etna a few months ago, experts recalled that there were about 500 other volcanoes on earth, active today, and which could blow their tops at any time.

In more than a month of rumbling and bubbling, Mt. Etna gave one of the most dangerous and dazzling displays of Nature's powers for many years. The power behind a volcanic eruption is enormous. One Russian eruption in 1956 was estimated by scientists to be equal to the explosive power of 200 hydrogen bombs. These experts claimed that such violence in the centre of a densely populated part of earth would kill more than 1 million people.

As it is, Etna slowly added up a growing toll of destruction. An observatory, bridges, roads, buildings and power lines were all destroyed by the hot lava flowing in rivers down the slopes of Europe's tallest and most active volcano. In Sicily men grappled for weeks with the problem of turning off the fiery mountain. A village of 2,000 people, lying in the lava's path, became a major target as the burning mountain's raging continued.

For those who live in the shadow of volcanoes known to be active there are two urgent problems. The first is devising some accurate way of predicting when the mountain is likely to erupt. The other is discovering a technique for stopping it once the bursting into activity has begun.

When a mountain decides to blow its top the first action begins many miles below the earth's surface. Then the steam, gases and lava (sometimes as hot as 2,000 degrees Fahrenheit) shower out. But the accurate prediction of a volcano's conduct is still quite a way off. Control of the burning mountains is even more remote.

Mount Etna's record has shown it to be dangerous at all times. It has erupted violently on more than 100 known occasions. In 1928 it blew a new crater and 1950 witnessed one of its most powerful eruptions, but it was three hundred years ago that it caused the greatest disaster in its history. Then the mountain awakened and, accompanied by an earthquake, killed 60,000 people.

Experts have been studying Etna and its behaviour for years. Seismologists have been keeping careful watch on nearby earth tremors, and an international team has been studying the crater floor. Other scientists have kept careful watch on other aspects of the dangerous mountain. Yet when it began to erupt, scientists were helpless. Some people suggested the bombing of the crater to control the lava flow; others suggested a rocket attack by aircraft on the mountainside for the same purpose.

(*continued on page* 619)



STAMPS BY JAMES A. MACKAY

Butterflies on Stamps

CONSIDERING that they are small colourful objects it is rather surprising that butterflies made a slow start in appearing on stamps. The answer probably lies in the fact that, until about ten years ago, stamp printing processes were not capable of reproducing these gorgeous creatures in full colour, and anything less could scarcely have done justice to the subject. The first country of the British Commonwealth to feature a butterfly on a stamp was Sarawak. A new definitive series appeared in 1950 and the 1 cent stamp, printed completely in black, featured a large native butterfly *Troides brookiana*, named in honour of the White Rajah, Sir James Brooke. Three years later the first Elizabethan series issued by British Honduras included a Blue Butterfly on the 25 cents stamp and for the first time some attempt was made to show the insect in its natural colour—blue, with a brown frame.

It was left to Switzerland, however, to show what could be done with modern multi-colour photogravure processes. Every year since 1913 Switzerland has issued stamps for the Children's Fund and in 1950 selected butterflies as the theme for four of the five stamps. The stamps were printed in photogravure, using three or four colours. Every year from then until 1957 moths and butterflies (and the occasional beetle) provided the subjects for these sets. Undoubtedly these eye-catching Swiss stamps showed the world the possibilities of this theme, and from then onwards stamps depicting butterflies became increasingly popular.

Butterfly stamps were issued by many countries in the Communist bloc in the late 1950's and early 1960's. The most outstanding set was that released by the People's Republic of China in 1963. It consisted of twenty stamps depicting such insects as the Tri-tailed Glory, the Yellow Orange-tip, the Blue-banded King Crow and the Philippines Birdwing—butterflies as colourful as their names would suggest. Mongolia produced an attractive set of butterfly stamps in 1963, the seven specimens having their Latin names inscribed on the stamps.

Although Africa can boast some of the most exotic butterflies, the countries of that continent were rather slow to issue such stamps. In 1966 Malawi issued a set of four stamps, and a miniature sheet, featuring butterflies. The stamps ranged in value from 4 pence to 3 shillings, but later the same year also issued a £2 stamp as part of the definitive series, and this depicted the butterfly *Cyrestis camillus*. This is the most expensive stamp in this theme, and one of the highest valued stamps issued by a Commonwealth country for many years. Butterflies were subsequently featured in the definitive series issued by New Zealand in 1970-71. Three butterflies (including that old favourite, the Red Admiral) and three moths were shown on the six lowest denominations of the series. These stamps are reasonably plentiful in fine used condition since they are still current.

Curiously enough, neither Australia nor Canada have yet featured butterflies on stamps, although a butterfly has been depicted on a British stamp. Two stamps were issued in 1963 to mark National Week and the 4½d value showed a medley of wildlife including a badger, a fawn, a great-spotted woodpecker and a long-tailed tit. You would have to examine this stamp very closely indeed to find the butterfly, but just below the figures of value is a brimstone butterfly.

The biggest boost to this theme came in February 1971 when the thirteen states comprising the Malaysian Federation each issued a new definitive series of seven low value stamps. A different butterfly was depicted on each of the seven denominations, the stamps of each state being identical apart from the inscriptions and the ruler's portraits. At the same time the Federal postal administration used butterflies as the subjects of the eight higher denominations inscribed "Malaysia". Incidentally, the $2 stamp of the Federal set features Rajah Brooke's Birdwing—the butterfly which appeared on the stamp of Sarawak twenty years previously. These stamps were lithographed with the butterflies in full natural colours against a background of flowers and foliage.

The most recent addition to this theme is a series of thirteen airmail stamps, issued by Surinam last July. The stamps were designed by N.C. Loning of Paramaribo and they feature some of the beautiful butterflies of South America. The stamps have been printed in four-coloured combinations by the Dutch printers Enschede en Zonen of Haarlem. The series, ranging from 15 to 75 cents, makes a most attractive display when mounted on the album page.



MUCK into MONEY

By E. R. Yarham

POLLUTION has been in the air in more senses than one of late. Garbage—junk, rubbish, refuse, litter, scrap, call it what you will—surrounds us nowadays by the million tons. The rose by any other name would smell as sweet, we are told. True and, equally, this throw-out from sophisticated societies may be given a less brusque name, but in fact it is nothing more than muck.

What's more, the not-to-be-proud-of fact is that the higher our standard of living the more muck we make. In more polished words, "Refuse output is directly related to the standard of living." In the international waste-making stakes the United States is away out in front. Britain lies a close third behind Sweden with the rest of northern Europe challenging strongly and Japan coming up fast. Britain's output per head has increased by 30 per cent by weight in 15 years and is expected to double in the next 15 years.

Dr. B. R. Brown, scientific adviser to the Greater London Council, says that three million tons of potential pollution in the form of municipal refuse are collected in the G.L.C. area every year, an average of 2.2 lb. a head a day. The Council estimates the total will increase to five and a half million tons over the next 20 years. At this moment 17 million tons of rubbish have to be removed throughout the country, an amount which will top 20 million tons by the end of the decade.

Fortunately there is another side to the picture. Everything is not lost, and the old saying, "Where there's muck there's money," was never truer than today. Scrap, in any guise, has become one of the country's most valuable and important industries. It is worth £1,500 million, and saves the country two-thirds of that amount in foreign exchange—£20 a year for everyone in the British Islands. So perhaps it is not surprising that the Steptoe image and the rag-and-bone man are out. So is the junk merchant. He has become a "reclamation expert" or "scrap reprocessor."

Although many experts think the ultimate answer to the problem of rubbish disposal will be the re-use or "re-cycling" of all such waste, the immediate problem is to pick up and get rid of the millions of bottles, cans, boxes, paper and other containers which people throw away. A survey made in the United States reported that highway trash consists of 60 per cent paper, 16 per cent cans and tins, six per cent bottles and jars, six per cent plastics and 13 per cent miscellaneous items. In Britain, motorists on an 11-mile stretch of the M6 in Staffordshire drop nearly a ton of rubbish every day. The nation dumps six million tons of paper and nine million square feet of corrugated board a year; and we also discard 5,000 million bottles and 700,000 tons of cans and tins.

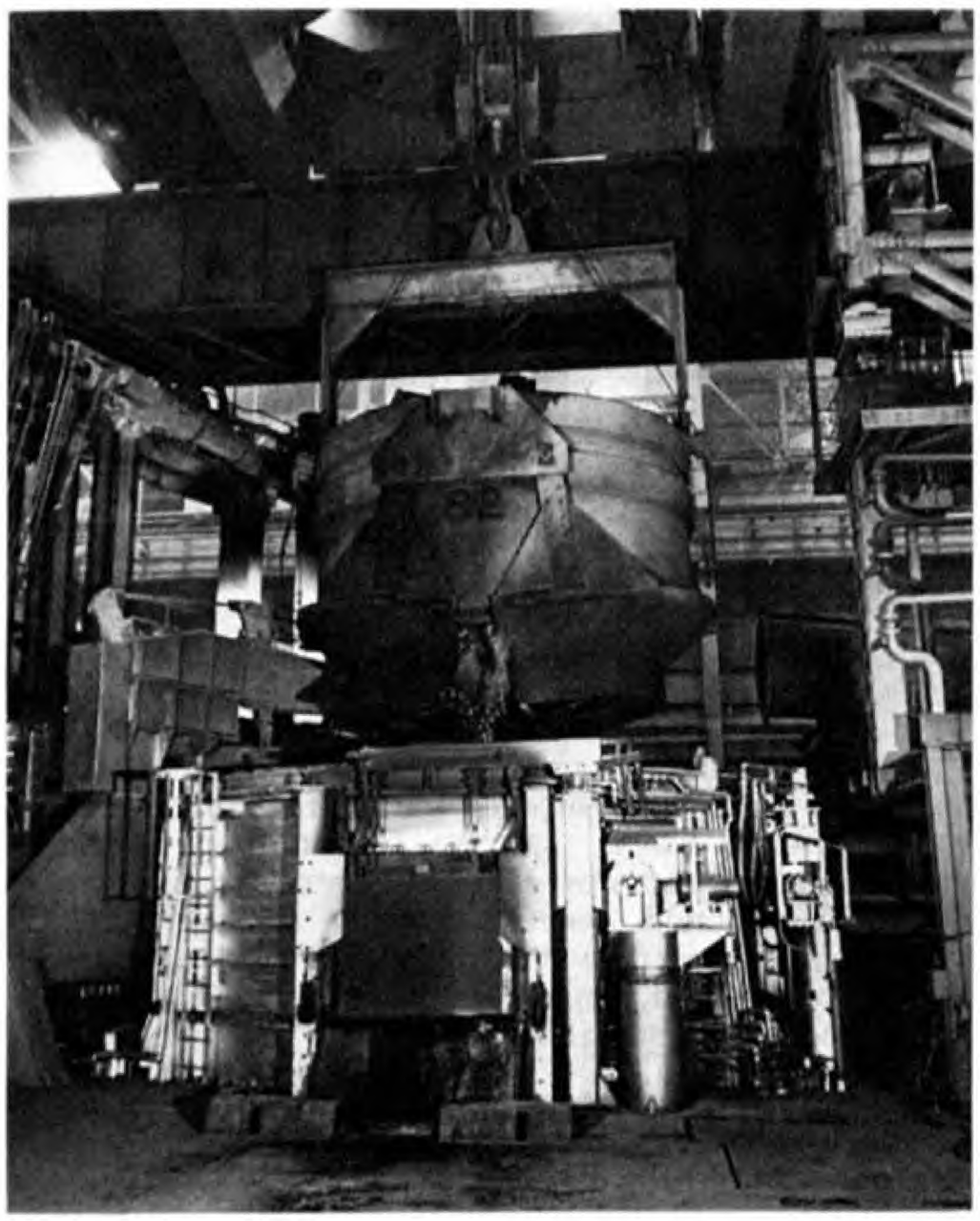
It is obvious that refuse is big business, one of the biggest in fact, with domestic garbage alone running at 300,000 tons a week. It costs £50 millions a year to shift this. So that one is prepared to hear Dr. B. R. Brown, mentioned earlier, advocate that a research programme into new techniques of waste disposal should be started, and that as a preliminary there should be a thorough assessment of the amount and nature of all wastes.

Although the cost of handling municipal refuse is high it is continually climbing. Yet the tens of millions need not be loss. On the contrary, if scientifically treated this muck can show a profit. There are three main ways of getting rid of it: salvaging, dumping or burning. London is quoted again because it is our greatest centre of population. The G.L.C. makes about £600,000 a year on salvage, mostly of paper, metals, bottles and cloth. Most of the rest has mainly been dumped in old gravel pits and on marshes. The Essex flats have been used for this purpose since the Middle Ages, but now water authorities are getting agitated over problems of pollution. Old gravel pit owners have done well by charging lorries around £1 a time for dropping their loads. But marshes and gravel pits fill up in time, and the country is running out of holes. The ever-increasing avalanche of rubbish has given them a scarcity value and, moreover, the modern idea is to turn them into boating and fishing lakes, a far more attractive proposal to the community.

Something must be done with the stuff. In less than 20 years London's rubbish every year will be enough to cover St. James's Park to a height of 350ft.—about as



Top, an Everest of junk cars, and, right, scrap steel arriving by barge at a steelworks in Wilmington, U.S.A. to be "reborn".
(Photos American Iron & Steel Institute)



Steel scrap being charged into an electric furnace. In steel-making from iron, a percentage of scrap steel is necessary with modern techniques.

high as St. Paul's Cathedral—predicts the leader of the G.L.C. The plan is to make much more use of burning, for it happens that modern rubbish is getting easier to destroy in this way. Cinders, which used to be a major ingredient of town refuse, are retreating before the advance of electricity, gas oil and central heating.

Dust is no longer the main burden of the refuse collectors. This is unfortunate for the brickmakers, who used to thrive on London's refuse. This used to be allowed to pile up in enormous heaps. One of these at the bottom of Gray's Inn Lane was not moved for a century until 1815 when the dust was extracted and sold to Russia to make bricks for the rebuilding of Moscow after Napoleon's invasion. On the other hand lack of dust makes for better burning.

People's eating habits have also changed. Because they buy pre-packed foods there are fewer vegetable peelings but more paper and plastic to throw out. They are bulkier than the old type of refuse and so there are more and more two-dustbin families. In its favour this garbage is cleaner and much easier to burn. It gives out almost one-third as much heat as coal. and local authorities are finding it more economical to burn the lot. As long ago as 1958 Glasgow opened a 22-acre incinerator at Polmadie. It cost £1,700,000 and was then the largest single refuse-disposal unit in Britain. The figure for an average city plant is likely to be £800,000—£1m. Smaller towns and rural areas still have enough space for controlled tips for refuse which has been pulverized. This is a cheaper method than incineration.

London has set out to prove that muck can be turned into money, for which purpose it has built an £11m. incinerator on a 22½-acre site at Edmonton in the Lea Valley Regional Park. The present cost of disposing of London's refuse is £2.1 a ton, but when the plant becomes fully operative the furnace will be "eating" 1,800 tons of refuse daily, and will also be producing electricity as a sideline. The incinerator has the potential for substantial profit-making, for reclaimed metal will sell for £250,000, there will be large quantities of clinker ash for building and drainage, and the heat produced by the burning rubbish will raise enough steam not only to run the plant but also to supply the domestic needs of 25,000 people. This will earn £500,000 from the National Grid.

Another way of handling garbage is to turn it into fertilizer. Several European cities are treating, drying and screening refuse for use as soil-conditioning compost. Madrid is composting 200 tons a day and Moscow has opened a 600-tons-per-day plant. Different processes are used and in this country one is being supported by the National Research Development Council. With this a disposal plant handling 100 tons of rubbish a day can produce 75 tons of fertilizer. A typical refuse disposal plant for a population of 100,000 costs £350,000.

Such a plant will produce at least 300 tons of fertilizer a week for sale at around £10 a ton. The refuse is fed direct into the machine from collection carts and almost any article of domestic rubbish is accepted, including old bicycle frames, refrigerator cases, rolls of carpet, and even old furniture. Plants of this kind will never lack "feed" because although less dense the increase by volume of town garbage since the war is approaching sixfold and is still on the up.

One of the most interesting examples of fertilizer production comes from Jersey, the holiday and market-gardening Channel Islands. There the century-old sewage system was discharging directly into the sea, which was not a good advertisment for the tourist trade. So the island built a £213,000 composting plant. It has been worth every penny. A Jersey deputy said, "We'd have paid that much just to keep the beaches unpolluted; but, in fact, we've saved ourselves money as well." By composting the refuse and selling it as fertilizer the cost of disposal has been cut by three-quarters.

The fermentation plant has six storeys. The refuse is cleaned of metal and glass, soaked in sewage sludge, and hoisted by grab to the top of the tower. Once a day the refuse drops a storey. In this way it is turned and aired and heats up to 160 degrees Fahrenheit. On the sixth day it reaches the bottom floor, free of all disease germs and weed seeds. It is now compost and is taken to maturing sheds for eight weeks, and is then sold to the island farmers.

A striking example of wealth from waste is afforded by paper, a discard which reflects changing social and economic conditions. Eighty years ago there was practically no paper. Now it accounts for a third of the total. Each year waste paper saves the country £60m. in wood pulp and finished products which would otherwise have to be imported. This equals the pulp yield of a forest the size of Wales. There are about 220 paper and board mills in Britain, half of them pulping collections of waste merchants as a raw material. Most of them use approximately 30 per cent waste paper and 70 per cent wood pulp.

The biggest lot job of all has been left till last—old cars. Every week in London alone 100 of these are abandoned, so that the national figure for the year of 150,000 can be seen to be no exaggeration. Although the Civic Amenities Act of 1968 imposed a fine of up to £100 for this offence, cast-off cars are still dumped in city streets, lay-bys and beauty spots, with their petrol

tanks potential bombs for playing kids. In all, Britain scraps a million cars a year, and someone has reckoned that, nose to tail, they would stretch from London to Madrid and back again.

Most cars have at least five tyres, and standard ways of destroying them include burning (with resultant clouds of evil-smelling, polluting smoke), burying and dumping in the sea. Some are cut up and sent overseas to developing countries for conversion into makeshift shoe soles. The Americans say this is sheer bad economics. For valuable chemicals, oils and gas with the heating power of the best North Sea kind can all be extracted if the tyres are treated in the right way.

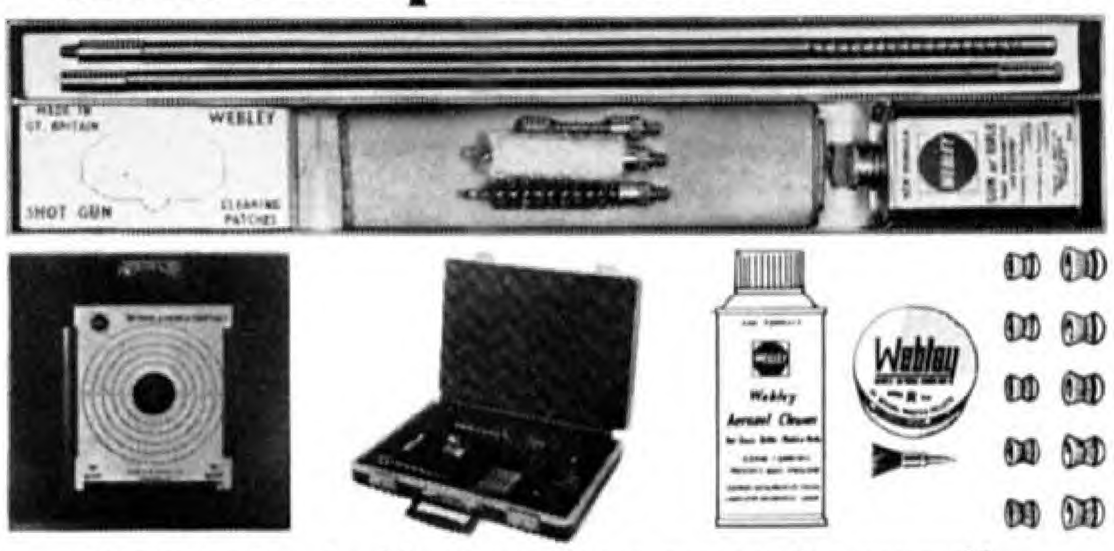
In the United States tyres have been reclaimed by baking them in retorts normally used for checking the coking quality of coal at the Bureau of Mines research Centre at Pittsburgh. When the tyres are heated to over 100 deg. gases are given off which yield 140 gallons of liquid oils per ton of tyres—about 100 used tyres go to the ton—and compounds of sulphur and zinc, as well as 1,500,000 cubic feet of gas with the heating value of the best natural gas. Large quantities of nitrogen can also be recovered. The residue in the retort, weighing just over a third of that original ton, consists of practically pure carbon, which can be used as lamp-black or compressed into graphite blocks.

Brother, look to thine own eye! At one time the Americans used to drop their junk cars in the sea off Long Island, but there as here a change in outlook has come about with scrap merchants battling for the rising pile of rusty assets. Wrecks quickly disappear these days into the maw of giant plants which welcome a diet of up to 1,000 tons of scrap a day, about 100 tons an hour. A whole car can be processed in a matter of minutes.

The cars, minus petrol tanks (removed as a safety precaution), are transported on a conyever and fed into a giant hammer-mill, where they are pulverized into small pieces. The tyres are usually removed by suppliers for separate disposal. Dirt, glass, rubber, plastics, and all non-ferrous elements are progressively eliminated by magnetization, incineration, and sterilization.

Welcome presents to give or receive

~ from a few pence to less than £16



If you're faced with prompting a present for yourself — or buying for a fellow shooting enthusiast — take a look at the range of Webley Shooting Accessories.
For stocking fillers — carefully gauged air weapon pellets and darts, aerosol gun cleaner, target cards and holders. Or what about a Webley cleaning set at £2.05 or a Webley telescopic sight at £3.99.
And for pride of place 'under the tree', Webley-Custom gun cases, elegance and protection for your pistol, rifle or shotgun from £5.14 to £15.75 according to size.
They're all at your Webley dealer now.

Webley Shooting Accessories

WEBLEY & SCOTT LIMITED
Dept. E111, Park Lane, Handsworth,
Birmingham B21 8LU.
Telephone: 021-553 3952/7

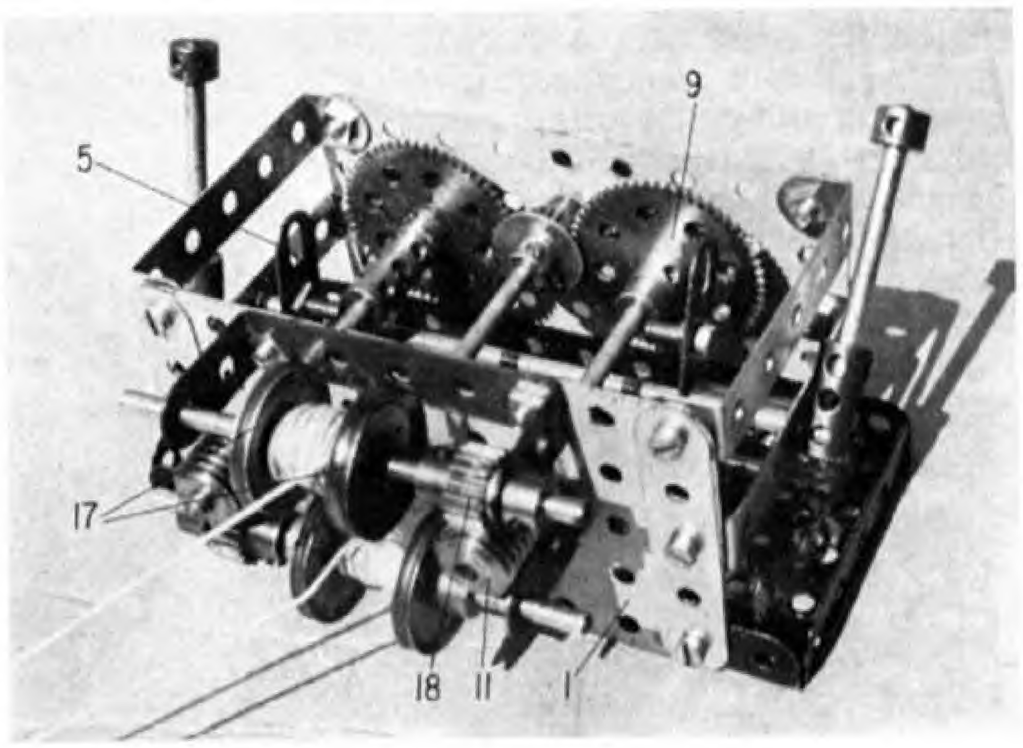
The resultant scrap, reduced to fist-size pieces, comes out clean, dense, relatively pure, uniform in size and consistent in quality, with a ferrous content of virtually 100 per cent. The steel industry snaps up all the scrap it can get of this quality.

Among the Model-Builders

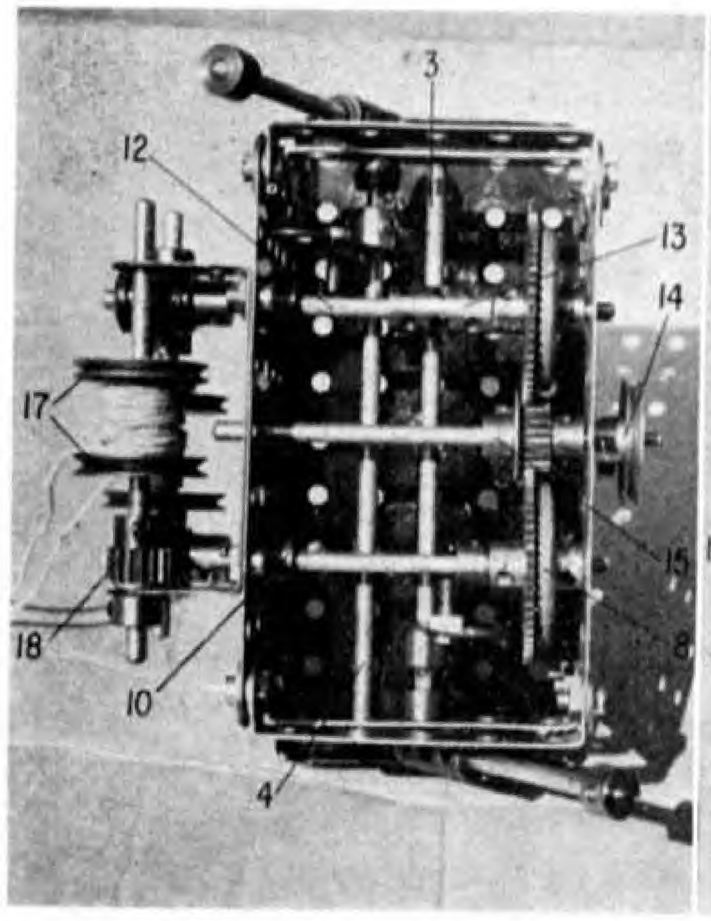
with 'Spanner'

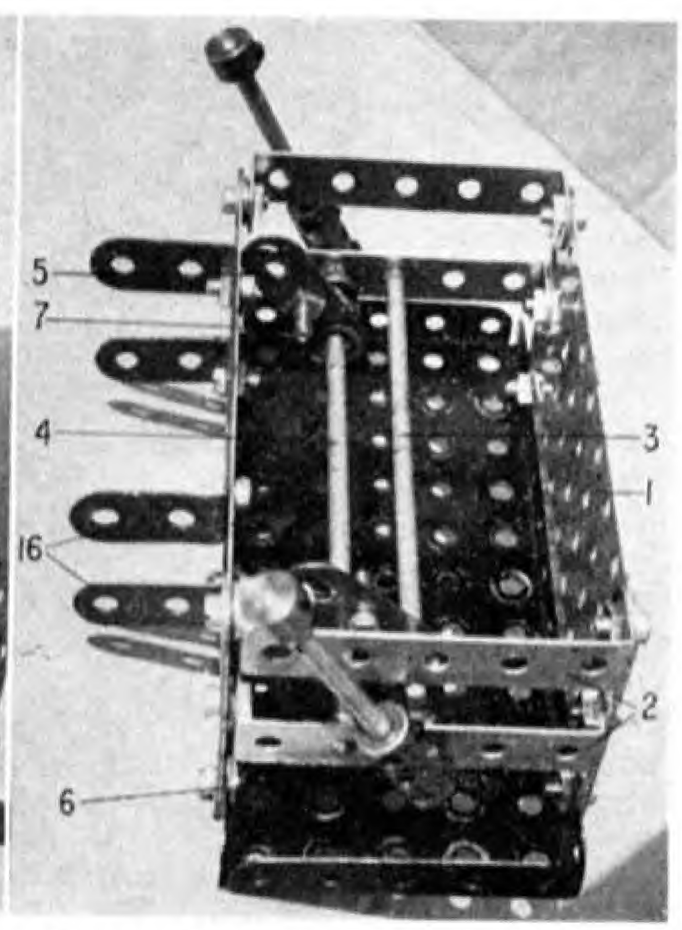
BEFORE covering anything else this month, I must add my own comments to those of my Managing Director, Mr. Fallmann, and of M.A.P. which are given in statements appearing elsewhere in this issue. The statements make clear that M.A.P. are regretfully discontinuing publication of the M.M. and that Meccano (1971) Ltd. are bringing it home to Binns Road. Rather than belabour the point, therefore, I would just like to say a sincere "goodbye" to my colleagues at M.A.P.

As many readers know—and most others have rightfully assumed—I am based at Binns Road in Liverpool and my efforts for the M.M. are actually paid for by Meccano Ltd. Nonetheless, I have had a very happy, enjoyable and—particularly important—an extremely co-operative relationship with M.A.P. over the past five years while they have been publishing the Magazine. We have worked well together and I have made many



A constant-mesh, twin-hoist mechanism for a crane, designed by Mr. F. G. Rayer of Longdon Heath, Upton-on-Severn, Worcs.





Left, the basic framework of Mr. Rayer's twin hoist unit without the winding drums and friction clutch cross-shafts. Far left, the completed mechanism, viewed from above.

personal friends among the editorial staff at Hemel Hempstead. Their interest, both in the M.M. generally and in the Meccano hobby in particular, has been strong and genuine and I know for a fact that the decision to relinquish the Magazine has been taken with the greatest reluctance. On a personal basis, therefore, I am very sorry to see the end of such a good relationship.

Having said this, though, I think I will be forgiven for also admitting to a feeling of delight that the Magazine is returning to Meccano. No matter how personally enjoyable it might have been "outside", I have always felt that the true place for "Meccano Magazine" is at Meccano itself, and your letters indicate that Meccano enthusiasts share the same opinion. This, after all, is where it all happens! I thus look forward to a continuing and perhaps more direct contact with readers through the "Meccano Magazine Quarterly", when it appears, and I sincerely trust that all Meccano hobbyists will themselves continue to support us in the new publication.

Crane Hoist

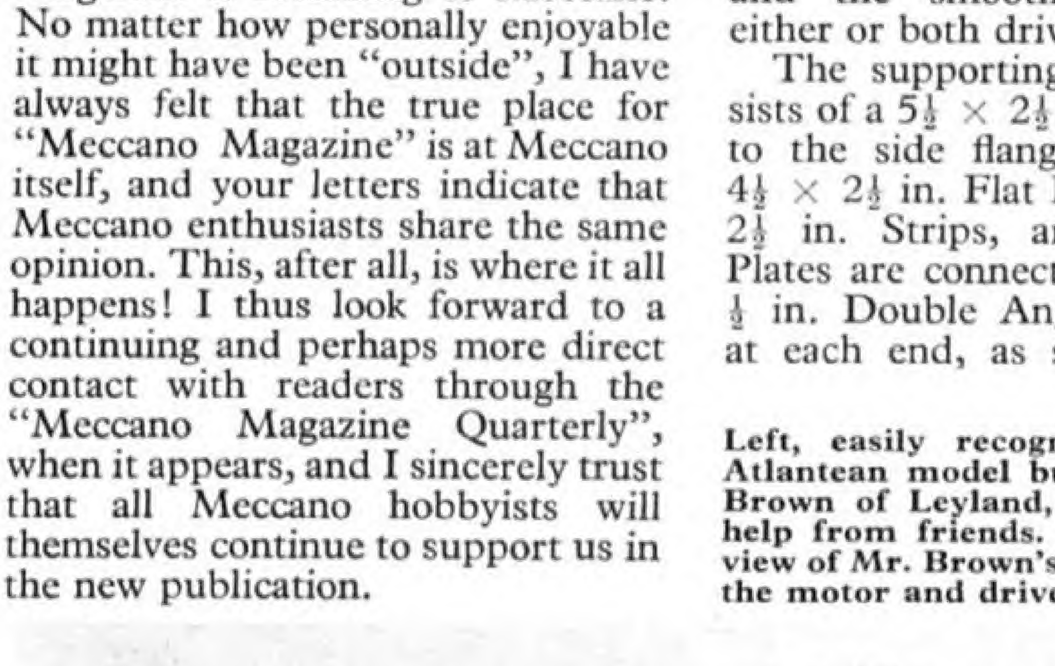
To move on to model-building matters, now, Mr. F. G. Rayer of Longdon Heath, Upton-on-Severn, Worcestershire, has supplied me with the accompanying illustrations and details of a constant-mesh, twin-hoist mechanism which will be of considerable interest to advanced crane builders. It has already been used with success for the jib and hook of a large crane and, says Mr. Rayner, "Its advantages lie in the automatic locking of the winding drums by the Worm drives, and the smooth engagement of either or both drives".

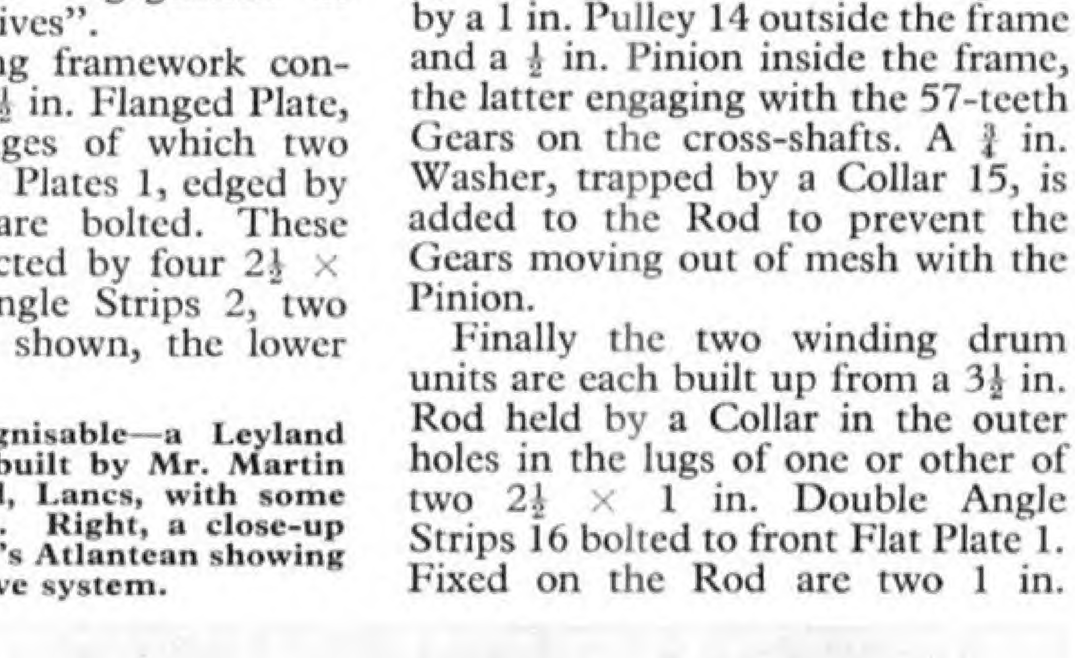
The supporting framework consists of a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate, to the side flanges of which two $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 1, edged by $2\frac{1}{2}$ in. Strips, are bolted. These Plates are connected by four $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 2, two at each end, as shown, the lower pair serving as bearings for the two control lever axles 3 and 4, both supplied by 5 in. Rods. Each Rod carries a Collar and Crank 5 inside the frame and a Coupling 6 outside the frame, the Rod passing through the lower transverse bore of the Coupling. Note that the Couplings on the two Rods are positioned at opposite ends of the framework. Fixed in the longitudinal bore of each Coupling is a 2 in. Rod, fitted with a Collar, which serves as the control handle, while a $\frac{3}{8}$ in. Bolt 7 is secured by a Nut in the centre of each Crank 5.

The first cross-shaft - supplied by a $3\frac{1}{2}$ in. Rod—is fitted in the positions shown with a fixed 1 in. Pulley with Motor Tyre 8 and a loose 57-teeth Gear Wheel 9, the latter held in place by a Collar. Crank 5 on Rod 3 is positioned so that Bolt 7 makes contact with the collar. A further Collar 10 prevents lateral movement of the Rod, while a Worm 11 is fixed on the end of the Rod outside the framework. The second cross-shaft 12 is similarly fitted out except that the Gear-securing Collar is replaced by a Coupling 13.

A centre cross-shaft is supplied by a third $3\frac{1}{2}$ in. Rod held in place by a 1 in. Pulley 14 outside the frame and a $\frac{1}{2}$ in. Pinion inside the frame, the latter engaging with the 57-teeth Gears on the cross-shafts. A $\frac{3}{4}$ in. Washer, trapped by a Collar 15, is added to the Rod to prevent the Gears moving out of mesh with the Pinion.

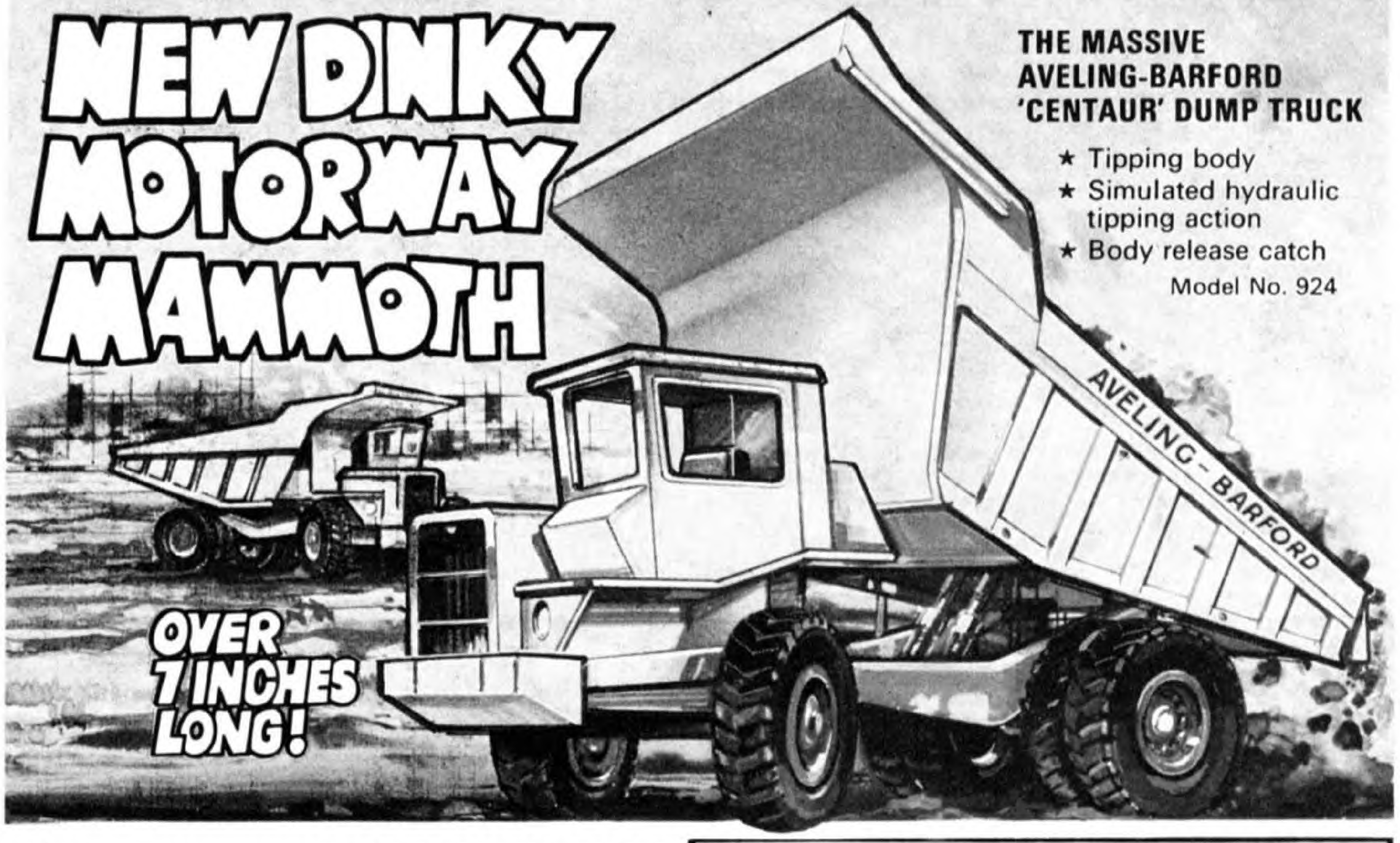
Finally the two winding drum units are each built up from a $3\frac{1}{2}$ in. Rod held by a Collar in the outer holes in the lugs of one or other of two $2\frac{1}{2} \times 1$ in. Double Angle Strips 16 bolted to front Flat Plate 1. Fixed on the Rod are two 1 in.





Left, easily recognisable—a Leyland Atlantean model built by Mr. Martin Brown of Leyland, Lancs, with some help from friends. Right, a close-up view of Mr. Brown's Atlantean showing the motor and drive system.

NEW DINKY MOTORWAY MAMMOTH



THE MASSIVE AVELING-BARFORD 'CENTAUR' DUMP TRUCK

★ Tipping body
★ Simulated hydraulic tipping action
★ Body release catch

Model No. 924

Get's you there fast LONDON TAXI

★ Opening Passenger Door
★ Driver ★ Moulded Seats, interior & windows.

Model No. 284



Another great Dinky Plane! HAWKER HURRICANE

★ A famous World War II plane!
★ Retractable undercarriage
★ Transparent canopy

Model No. 718

RAT···TAT···TAT···TAT·····



The INVINCIBLE 155 mm MOBILE GUN

(Available January)

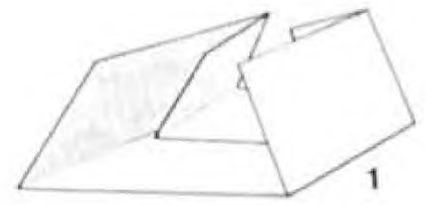
★ Gun barrel raises and lowers.
★ Operated by elevating handle.
★ Spring operated firing mechanism fires miniature "shells" (6 supplied).
★ Flexible tracks.

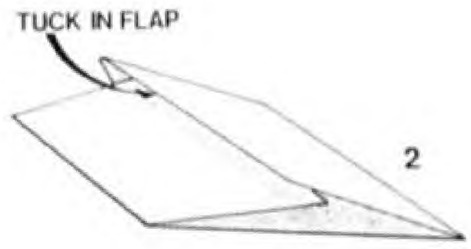


Model No. 654

Dinky TOYS®
tough action packed models

IMPORTANT: To ensure that you are advised of matters relating to the "Meccano Magazine Quarterly", please complete the details below; remove this page from the magazine and fold it as shown in the diagram on the right, then return it to Meccano (1971) Ltd. No Postage Stamp is required if posted in Gt. Britain, the Channel Islands, or Northern Ireland. If you do not wish to mutilate the magazine by removing the page, a Post Card to the address shown, requesting details, will suffice. In this event, the Card must be stamped.





2nd Fold

Postage will be paid by Meccano (1971) Limited

Do not affix Postage Stamps if posted in Gt. Britain, Channel Islands or N. Ireland.

BUSINESS REPLY SERVICE
Licence No. LV 3929

MECCANO (1971) LTD
BINNS ROAD
LIVERPOOL
L13 3AB

1st Fold

3rd Fold

Please send me details of how to obtain the "Meccano Magazine Quarterly". **I understand the new publication will only be obtainable direct from Meccano (1971) Ltd.** Please note that this is NOT a subscription order and places me under no obligation.

Name .....

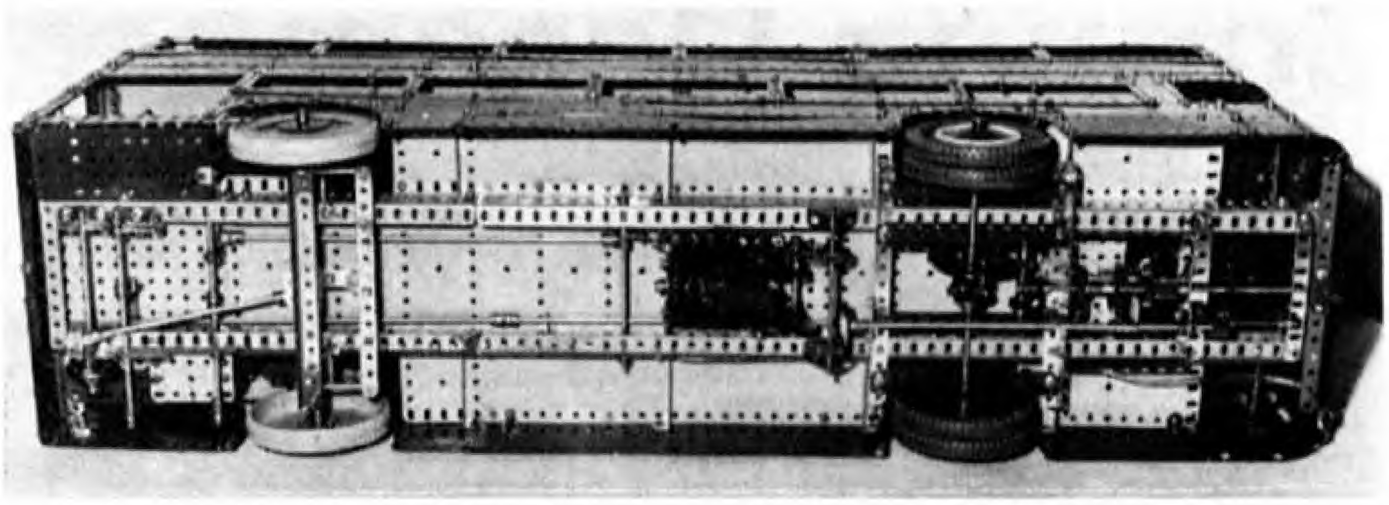
Address .....

.....

.....

.....

Age (if under 18) .....



An underside view of the Leyland Atlantean showing the chassis layout.

Pulleys 17, bosses inwards, and a $\frac{1}{2}$ in. Pinion 18, this Pinion meshing with the nearby Worm on the end of the appropriate cross-shaft. A Cord Anchoring Spring is carried on the Rod between the bosses of the Pulleys.

In operation, drive is taken to Pulley 14 and is subsequently transmitted to one or other, or both, winding drums by moving the control handles so that Gear Wheels 9 are forced against Pulleys with Tyres 8. The Gears and Pulleys, of course, make up simple friction clutch arrangements. Mr. Rayer also points out that Pulley 14 can be replaced by any other suitable part to receive the drive, as dictated by individual requirements.

PARTS REQUIRED

4—5	2—27a	2—46	3—63
2—15	2—32	4—48a	2—111c
5—16	18—37a	1—52	2—155
2—17	16—37b	2—53a	2—176
7—22	2—38	10—59	
3—26	1—38d	2—62	

Leyland Atlantean

For general interest, now, I would like to draw attention to the remaining photographs, reproduced here by kind permission of the "Leyland Truck and Bus Times". They show a very well-proportioned and finely detailed model of a Leyland Atlantean bus, built by Mr. Martin Brown of (appropriately!) Leyland in Lancashire. Mr. Brown tells me he was helped with construction by three of his friends and the results obtained were so good that the model caught the interest of the Editor of the "Leyland Truck and Bus Times" who subsequently featured it in his magazine.

"The bus", writes Mr. Brown, "Has a total length of 3 ft. 1 in., a height of 1 ft. 5 in., a width of $9\frac{1}{2}$ in. and it weighs approximately 28 lbs. It is powered by an E15R Motor, mounted a few inches in front of the rear axle. In a real Atlantean, the engine is of course mounted behind the axle, but there was insufficient room for this in the model. The drive is taken behind the rear axle, where it reaches the input shaft of the gearbox after a 3 : 1 reduction ratio. The input shaft carries a $\frac{1}{2} \times \frac{3}{4}$ in. face Pinion which meshes constantly with a $1\frac{1}{2}$ in. Gear on the sliding layshaft. The drive is then taken to the output shaft which is journalled at one end in the $\frac{3}{4}$ in. face Pinion. Using the gears shown in the photographs, the output ratios are 1 : 1, 2 : 1 or 4 : 1. From the gearbox, the transmission goes to the rear axle differential via two Bevel Gears".

Mr. Brown goes on to explain that the steering linkage follows the true Ackermann principle: "When the steering wheel is turned, bevels rotate and pull a draglink which turns a bell crank mechanism on the front axle. One arm of this bell crank is pivotally attached to the track rod.

"Journalled across the chassis ahead of the front axle are two shafts turned by levers in the cab. The foremost shaft controls the gearbox layshaft and the rear shaft controls the E15R Motor switch, the shafts being connected to their relevant "operations" by longer shafts running parallel to the chassis, between the chassis members. The chassis itself is of rigid construction, each side composed of a compound channel girder with a cross-sectional area of $1 \times \frac{1}{2}$ in. The bodywork is secured to the chassis in numerous places, the floor being fixed directly on top of the chassis.

"Total seating accommodation is 51, with 29 seats in the lower saloon and 22 in the upper saloon. A spiral staircase connects the two saloons. The entrance is divided into two sections by a handrail fixed as shown in the photograph, while other details include headlamps, driving mirrors, etc."

This is as far as Mr. Brown goes with his description, but it is, I feel, enough to give a fair idea of the features he has included in a very worthwhile model. It also closes the last "Among the Model-builders" article with M.A.P.—the next will be in the first issue of "Meccano Magazine Quarterly". See you then!

500 MOUNTAINS (*continued from page* 611)

It's more than thirty years ago since, on Mount Larvna Loa in Hawaii, these techniques were first tried out. The results have never been satisfactory. Hence, apart from evacuations to save life and movable property, there is little man can do but wait for the mountain to blow itself out.

But volcanoes are not all bad. They add rich fertilisers such as potash to the soil, and their gases, turned into sulphur, can be mined. Sometimes eruptions bring minerals from the inner depths of the earth to the surface. Even diamonds have been found in the necks of old volcanoes.

Among the most recent uses for the volcanic waste is to turn it into rockwool which is used to insulate walls and thus stop a heat loss in homes. Another benefit, apart from sulphur springs and geysers, lies in harnessing volcanic energy. For instance, by boring down to the hot lava when a mountain is inactive and then pumping water down into it, the energy, released as steam, could provide as much as a giant power station working flat out for 25 years.

Today the men and women who live in the shadow of known volcanoes have much to fear. Experts claim that none of them ever becomes extinct. They only rest for a few hundred years at most and then burst into activity again. But, while the burning mountains are inactive, men can still tap their resources to provide central heating for homes and energy to provide electricity.

The Editor and staff of Meccano Magazine would like to thank all readers for their support, to wish Meccano Magazine Quarterly a successful future, and, since this is the December issue, to wish everyone a Merry Christmas and a happy, prosperous, and peaceful 1973.

Coming December 1st

. . . the new look modelling magazine in large A4 size ($11\frac{3}{4}'' \times 8\frac{1}{4}''$) format, with 40% increase in page area, and expanded coverage of all that is new in the world of scale modelling

Scale Models

Incorporating Model Cars

Starting with January 1973 edition, this popular MAP hobby magazine enters a new phase with bigger, even more detailed scale plans, a special car section, colour, larger photo's and new regular features.
On sale first Friday each month 20p

Reserve your copy NOW! At Newsagents and Model Shops

Model & Allied Publications Ltd., 13-35 Bridge St., Hemel Hempstead

PLANES BOATS CARS TRAINS MECCANO

MODEL SHOP DIRECTORY

M *denotes Meccano accessory and spare parts specialists*

LEICESTER Tel: Leicester 21935

RADIO CONTROL SUPPLIES

52 LONDON ROAD,
Mail Order Specialists.
Closed Monday.
Open until 8.30 p.m. Friday.
The Showroom of the Midlands with full R/C service facilities.

AYLESBURY

Tel: 85752

TAYLOR & McKENNA

46 FRIARS SQUARE

CARLISLE Tel: Carlisle 23142

PALACE CYCLE STORES,

122 BOTCHERGATE, CARLISLE.

Meccano Stockists for Airfix, Dinky, Matchbox, etc.

LONDON Tel: Regent 1846

JEREMY,

16 PRINCES ARCADE, PICCADILLY- LONDON, S.W.I. MECCANO ACCESSORY AND SPARE PART SPECIALIST.

M

BATH Tel: 60444

CYRIL HOWE'S

CHEAP STREET, BATH, SOMERSET

The Model Shop of the West for all your modelling requirements. Aircraft, Boats, Engines, Radio Control. Expert advice available. M.A.P., Meccano Sets, spares, etc.

HEMEL HEMPSTEAD

Tel: 53691

TAYLOR & McKENNA

203, MARLOWES

M

LONDON Tel: 01-560 0473

RADIO CONTROL SUPPLIES

581 LONDON RD., ISLEWORTH, MIDDX. Mail Order Specialists
Open each weekday and until 8.30 p.m. Fridays.
Largest R/C stockists in the country.
Own R/C service centre.

BIRMINGHAM Tel: 021-444 3237

KINGS HEATH MODELS

5 York Road, Birmingham 14.

Everything for the modeller: Boats, Cars, Planes, Railways, Kits, etc. Meccano sets and reasonable stocks of spares.

HORSHAM Tel 61533

MODEL CORNER

30 NORTH STREET, HORSHAM SUSSEX.

Comprehensive range of kits, including Airfix. Tamiya, Revell, etc. Overseas enquiries invited. P & P extra.

LONDON Tel: 01-959 2877

H. A. BLUNT & SONS LTD.,

133 THE BROADWAY

MILL HILL, LONDON N.W.7.

M

BRADFORD Tel. 44556

TRAIN SHOP SUPERMARKET
4 BERTRAM ROAD, BRADFORD 8.
All makes of Model Trains and Motorways Shop Surplus, Bankrupt and Slightly used.
Catalogue 1/- Post Free.
COLLECTORS' MODELS, Matchbox, Dinky, etc.
WAR GAME FIGURES & ACCESSORIES
Minitanks, Hinchcliffe, etc. List S.A.E.

KENT Tel: Erith 32339

DERRETT (TOYS) LTD.,

52/54 ERITH HIGH STREET, ERITH, KENT.

Aircraft, Boats, Fibreglass Hulls, Tri-ang-Hornby, Lima, H.O., H & M.. Units, Scalextric, Airfix, Riko, Pactra, Plastic kits, Minitanks, Marquetry. Prompt Mail Order Service.

MIDDLESEX

Hodgson's Toys & Models Ltd. (MEC)
44/46 Hounslow Rd., Twickenham TW2 7EX.
(Nearest station, Whitton S.R.)
Wide range of Meccano Sets & Accessories, Dinky Toys, Plastic Meccano, Corgi Toys also Model Railways, Boats & Aircraft.
Early closing Wednesdays
No parking restrictions

CARDIFF Tel: 0222-22245

THE MODEL SHOP,
John Hall Ltd., 22/24 Morgan Arcade
Cardiff's leading Model Shop
Meccano sets, accessories and spares. Tri-ang and Scalextric repairs and spares. Plastic, metal and wood construction kits. Aero Marine and railway etc. Diesel and Glow engines and Radio Control, marquetry, Dinky, Corgi, Politoy and Hot Wheels, cars, etc. Credit terms.

LEEDS, 1 Tel: 25739

BRADFORD MODEL RAILWAY CENTRE,

23 ALBION PLACE (Off Briggate).

The North's Leading Model Railway stockists in OO and N gauges. Branches at Cloth Hall Street, Huddersfield and Frizinghall, Bradford.

NEW ZEALAND

BUNKERS LTD.,

P.O. BOX 58
HASTINGS.

(Mail orders from all countries welcomed.)

M

READING Tel: Reading 51558

READING MODEL SUPPLIES
5 Chatham St. Car Park, Oxford Road, READING, BERKSHIRE.
BERKSHIRE'S MODEL CENTRE
You can drive right to us.

STOCKTON-ON-TEES Tel: 67616

LESLIE BROWN
95 HIGH STREET, STOCKTON-ON-TEES, TEESSIDE STS18IBD
Super Toy and Model Store. Meccano Range and Spare Parts. Mail Orders welcome. M

WELWYN

H. A. BLUNT & SONS LTD.
38 FRETHERNE ROAD, WELWYN GARDEN CITY, HERTS.
Complete range of model aircraft, engines and accessories, boats, cars and railways. M

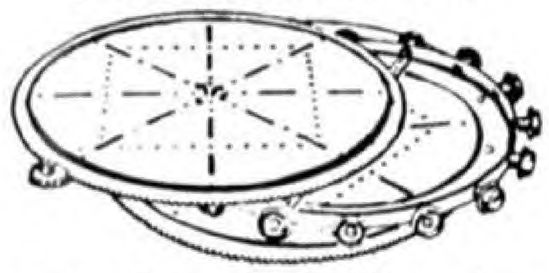
SCARBOROUGH Tel: 3223

"WALKERS"
15 ST. THOMAS STREET, SCARBOROUGH, YORKS.
Meccano and Dinky Toy Specialist.
Mail orders welcomed.

WATFORD Tel:Watford 44222

CLEMENTS,
THE PARADE, WATFORD.
Always a comprehensive range of Meccano Sets, Accessories and Dinky Toys.

EVERYTHING
MECCANO®
MW REPLICA PART 167A
(Limited production run)



167a Roller Race, geared, 192 teeth; each—£5.95 (£5.10)
Postage: One 25p (£1.30 *) Two 29p (£1.30 *)
167 Geared Roller Bearings, complete—£16.36 + 29p post (£13.95 + £1.30 * post)
G.M.M.'s FINEST YET!
"THE DEVELOPMENT OF THE MECCANO SYSTEM"
1901–1972
By R. R. Hauton and A. Hindmarsh
170 Foolscap pages list all Obsolete and Current MECCANO Parts, Motors, Transformers, Aeroplane & Car Constructor Parts. All design variations are listed, to a total of over 1500, many illustrated by fine line drawings. A *must* for MECCANO Collectors and Historians.
£3 Postage 14p (15p)
G.M.M. Modern Supermodel Leaflet:
No. 22 French Pacific Locomotive 78p + 6p post
See page 537, Nov. 1972 *Meccano Magazine*.
*Approximate price.
Tax free overseas prices in brackets.

We look forward to advertising in the new "MECCANO MAGAZINE"—in the meantime, 4p Stamped Addressed Envelope (Overseas 4 reply coupons) will bring you our latest illustrated Price Lists of:
Meccano Sets, Accessory Sets, and Motors.
Standard Meccano Spare Parts 1–235f
Meccano Clock Parts 20c, 109a, 251–267
Meccano Elektrikit Parts 500–590
Meccano Electronic Control Parts 602–622
Replica Obsolete Parts 57–174
Spare Parts for Meccano Motors.
All Current Meccano Literature.
G.M.M. Meccano Publications, including the G.M.M. Series of Modern Meccano Supermodels.
M.W. Meccano Engineer's Publications.
And all the latest news on developments in the Meccano world.
See also our regular advertising in:
"THE MECCANOMAN'S JOURNAL"
Quarterly 34p + 4p post
WORLD WIDE MAIL ORDER A PLEASURE
Overseas orders U.K. tax free
MW MODELS, 165 READING ROAD
HENLEY-ON-THAMES, Oxon. RG9 IDP
ENGLAND Tel: (049-12) 3342

CLASSIFIED ADVERTISEMENTS

FOR SALE—PRIVATE

W.R.I. Replica Meccano Parts. These perfect copies are available as follows: P/N 57a, Scientific Hook, 25c each; 106a, Sand Roller, $2.00; 119, Channel Segments, $8.00 per set of 8; 127, Simple Bell Crank, 40c; 156, Pointer, 75c; 174, Grease Cup, 60c. Postage extra.—W. R. Inglis, 219 Blackburn Road, South Blackburn, 3130, Victoria, Australia. H.I.

For Sale. M.M.'s 1942 to 1964. Best offer secures.—W. Balmer, 8 Tynevale Terrace, Newcastle, NE6 4LL. H

Strong plastic wheels 2" diameter, 3,000—£60. Sample 8—50 pence, including post. 22 Bramley Avenue, Canterbury. Tel: 66149. H

GENERAL

Musical Movements and New Musical Box Kits.—Repairs, Plans, Hinges, Dolls eyes and Growlers etc. Send s.a.e. for Tunes List or 15p for 'Hobby's Annual' including full catalogue. W. Hobby Ltd., 62 Norwood High Street, London SE27 9NW. Telephone 01-670-6220. T/C

WANTED—PRIVATE

Wanted. Dinky buses prior to Routemaster model. State price.—Smith, 526 John Williamson Street, South Shields. H

FOR SALE—TRADE

Outstanding stamp offer! 5 top quality Commonwealth sets, 25p, 10 for 45p. S.A.E. please.—Dawes, 17 Wigmore Street, London W1H 9LA. H

WANTED—TRADE

Pre War O or I gauge model locomotive and coaches sought, made by Marklin, Bing, Lowke or Hornby, good price paid.—Procter, 10 Churchill Hill, Patcham, Brighton. Tel. 553940. T/C

"M.M.s" 1916-1942. Available/Wanted. £40 (minimum) offered for complete set. Lambert, 60 Salhouse Road, Rackheath, Norwich NOR 01Z F-K

BOOK

Broadside. The quarterly read by Naval Wargamers, enthusiasts and 1-1200 scale collectors. 35p. Broadside (M), 97a Kirkwood Road, London, S.E.15. B-H

6v. D.C. 2,750 r.p.m. MOTOR
Constant speed, precision made. Length 2 $\frac{11}{16}$", dia. $\frac{13}{16}$", Shaft $\frac{3}{16}$", dia. $\frac{1}{4}$". No load 40 ma., normal 35)ma. 7 pole armature, ball race bearing.
List £3.50, **OUR PRICE £1.25**
p & p 10p.
HARRINGAY ELECTRICAL SUPPLIES
435 Green Lanes, London N.4



THE SECOND ANNUAL
MECCANO®
EXHIBITION
HENLEY-ON-THAMES TOWN HALL
will be held on
SATURDAY, SEPTEMBER 1st
1973
MECCANO Models of all types welcomed for display—contact the organizers:
MW MODELS, "Everything Meccano", 165 Reading Road, HENLEY-ON-THAMES, Oxon, RG9 IDP
Tel: (049-12) 3342

NEW - available shortly
The first two books in
THE MECCANO ENGINEER'S
Library Series
COMPANION BOOKS
for the MECCANO Model Builder
By Mike Nicholls
"HANDBOOK OF MECCANO PARTS"
£1.50 Postage 12p (8p)
"CHECKLIST OF MECCANO PARTS"
75p Postage 12p (8p)
The HANDBOOK lists all Current and Obsolete MECCANO Parts 1–622 in *numerical order* and includes all variations with a separate model building use. Spaciously presented and profusely illustrated, it also lists the quantities of each part contained in the largest outfit of 1928, the 1930's, and the present day, for comparison purposes.
The CHECKLIST is a special edition of the complete Spare Parts list as above, but without illustrations. It is intended to be used as an Inventory to record the contents of your own outfit, three blank columns being provided for the purpose.
M.W. PUBLICATIONS are available from:
MW MODELS, 165 READING ROAD
HENLEY-ON-THAMES, Oxon. RG9 IDP
ENGLAND Tel: (049-12) 3342

THE NEW PERRIS JIGSAW
Ideal for all modelmaking, the heavy construction and no nonsense design make it suitable for continuous working in industry, schools, and hospital occupational therapy units. Safe to operate, and accurate, it will cut wood to an inch thick with ease.
Price for 12" Arm model £7.50 + 45p carr.
15" Arm model £8.50p + 45p carr.
Can also be supplied fully motorised ready to plug into mains. Illustrated leaflet available, stamp appreciated.
Enquiries invited from Model Shops.
B. R. PERRIS machine tools,
61 St. George Street, Norwich 16J.

ENTER SMITHS

ACTION MAN

SECRET CODE COMPETITION!

1,000 'ACTION MAN' KITS (WORTH £9 EACH) AND 4,000 'ACTION MAN' BOOKS TO BE WON!

EACH 'ACTION MAN' KIT CONTAINS 'ACTION MAN' SOLDIER, FROGMANS KIT, ARCTIC KIT, SPECIAL OPERATIONS KIT, ASSAULT CRAFT KIT **5 FABULOUS OUTFITS TO LAUNCH ACTION MAN INTO YOUR OWN EXCITING ADVENTURES.**

IN THE DEAD OF NIGHT A MYSTERY SUBMARINE SURFACES SOMEWHERE OFF THE ENGLISH COAST...

FRANK LANGFORD

WHAT ARE THEY UP TO? ARE THEY PLANNING AN ATTACK?

ACTION MAN ON COASTAL PATROL PICKS UP A SECRET CODED MESSAGE FROM THE SUB...

CAN ACTION MAN CRACK THE CODE IN TIME TO FOIL THEIR PLANS?

THIS IS THE CODE

CAN YOU CRACK THE CODE AND WIN THE FANTASTIC 'ACTION MAN' PRIZES? COLLECT THE TWO PARTS OF THE CODEBREAKER ON SPECIAL PACKS OF SMITHS QUAVERS, CHIPSTICKS, SMOKEES, AND CHIPITOS.



ENTER THE ACTION MAN SECRET CODE COMPETITION – BEFORE ITS TOO LATE

14368...51627...18...2196

Printed in Great Britain by STAPLES PRINTERS LTD., Kettering, Northants., for the Proprietors, MODEL & ALLIED PUBLICATIONS LTD., 13/35 Bridge Street, Hemel Hempstead, Herts. Published by the ARGUS PRESS LTD 12/18 Paul Street, London, E.C.2., to whom all trade enquiries should be addressed.
Registered for transmission by Magazine Post to Canada.

NEW DINKY MILITARY MIGHT!

FIRES!

ELEVATING GUN

SWIVELLING TURRET

MOVING TRACKS!

NEW CHIEFTAIN TANK

PRIDE OF THE ARMOURED CORPS!

A fabulous new model with
- Shell firing gun
- Elevating gun barrel
- Full traverse swivelling turret!
- Moving tank tracks!
- Model No. 683

677 GREAT NEW

TASK FORCE SET



681

682

680

Three great tough, chunky fighting vehicles all in one set!

Model 681 DUKW
Model 682 STALWART LOAD CARRIER
Model 680 FERRET ARMOURED CAR
All fitted with SPEEDWHEELS



NEW! U.S. ARMY T-42A
- Retractable undercarriage and nose wheel
- Lift-off engine covers Model No. 712

Dinky TOYS®

the tough, action-packed models

Colour of model may differ from illustration